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Could U.S. DP Handle Gas Rationing?

By Jake Kirchner
CW Washington Bureau

ASHINGTON, D.C. — Many Ameri- ns probably assume that seven years after t first serious oil shortage in the U.S., the vernment is prepared to institute gas ra- ning in the event of a major gasoline ortfall.

he truth, however, is that the Department Energy (DOE) is one or two years away m finishing a reliable rationing plan, and w there are serious questions about the equacy of U.S. DP capacity to administer ioning.

We don't know if the United States has the data processing capacity to do the job," an American Bankers Association (ABA) official said at a recent ABA conference in New York.

According to J.C. Welman Jr., head of the ABA gasoline-rationing task force, the enormous task of consolidating a national vehicle registration data base, issuing gas allocation checks for some 150 million vehicle owners and processing the millions of coupons that would be the currency of rationing could overwhelm the DP capabilities of gas-rationing agencies.

Welman, executive vice-president of the First Bank of Minneapolis, suggested a survey of U.S. DP capacity for such a program be carried out as soon as possible.

He noted that following a relatively mild winter, the U.S. is enjoying a gasoline surplus, but with the unsettled state of affairs in the Mideast and with Americans "returning to their wasteful ways," the threat of an oil crisis is ever-present.

Plan 18 Months Away

Although it would take six months or so for an oil embargo to be felt in the U.S., the DOE is as much as 18 months from having a workable gas-rationing plan, and once com-

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NEWSPAPER

IBM 4300 Users Baffled By IPO/E; OS vs. DOS

By Tom Henkel
CW Staff

NEW YORK — IBM 4300 users are generally baffled over what is required to install and operate their systems.

IBM's Installation Productivity Option/-Extended (IPO/E), a method of generating and maintaining 4300 software, seemed to draw the most widespread confusion, but other basic areas — for example, what operating systems are available on the 4300 and what IBM peripherals will run on that CPU — also drew questions at a one-day seminar sponsored by Advanced Systems, Inc. here.

Speaking to about 150 DPers with installed or soon-to-be-installed 4300 systems, session leader John Ennever, senior consultant with London-based Altergo, Ltd., took a ground-up approach in explaining concepts associated with the 4300 line.

While fundamental ideas such as the basic qualities of the 4331 Model Group 1, Model Group 2 and 4341 CPUs drew few questions, discussions on DOS/VSE vs. OS/VS1 operating systems and IPO/E sparked extended debates.

Sysgen Concerns

How much disk space a system generation (Sysgen) under IPO/E will actually use seemed to be the biggest concern among participants. Based on IBM's basic requirements, Ennever, who installed two 4331s at Altergo's London office, said a 512K-byte 4331 (a system he does not recommend) will require the equivalent of four 3310 disk drives.

The 1M-byte version of the 4331 Model Group 1 as well as the full Model Group 2 line and the 4341 will require the equivalent of five 3310s, Ennever said.

Ennever parted from IBM's recommendations by suggesting those Sysgen requirements will be permanent. IBM has said up to 60% of total disk space used during a Sysgen can be recovered. It further contends that virtual memory needed to maintain a generated system can be condensed into 60% of a single 3310 disk drive [CW, Feb. 4].

It would be easier, especially for nov-

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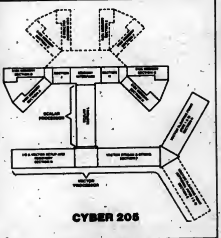

System Architecture

CDC 205 Runs 800 Million Operation/Sec

By Rita Shoor
CW Staff

MINNEAPOLIS — In tha world of supercomputers, where 16M bytes of main memory is considered a nice round number and vendors speak casually of hundreds of millions of operations per second (Mops), Control Data Corp. has announced tha Cyber 205 — a system capable in its maximum configuration of performing 800 Mops, according to the company.

The new system competes directly with Cray Research, Inc.'s Cray-1S machine, a CDC spokesman said. However, he described the 205 as "Cray-independent ... It's a pure CDC machine." (Seymour Cray, who formed Cray Research, was formerly employed by CDC as a designer of its 6000 and 7000 series.)

The Cyber 205 is the second member in the Cyber 200 series and, like its predecessor, the model 203, large-scale integrated (LSI) bipolar circuitry is utilized in the unit's scalar processor.

However, logic boards from CDC's Star-100 used in the earlier model's vector processor have been replaced with 168 gate/chip LSI circuitry in the Cyber 205 vector unit.

This architectural modification was predicted about six months ago [CW, Jan. 7].

The Cyber 205 processor consists of a scalar and a vector unit (see architecture diagram). The scalar (serial) unit performs a single operation or instruction up to a maximum of 50 Mops. It operates with a 64-word instruction

(Continued on Page 2)

IBM Charged With Race Discrimination

By Jake Kirchner
CW Washington Bureau

BALTIMORE — IBM has been charged with race discrimination in a suit filed on behalf of black employees at the firm's four Maryland facilities by the U.S. Equal Employment Opportunity Commission (EEOC).

The action, filed in federal court here last Tuesday, alleged that IBM consistently discriminates against its black workers by failing or refusing to promote blacks or to consider blacks for vacancies in managerial positions; does not pay black professionals as well as whites in equal positions; and maintains discriminatory employee performance evaluation practices.

Responding to the suit, an IBM spokeswoman at the firm's Armonk, N.Y., headquarters said "we believe the charges are totally without merit and we intend to defend ourselves vigorously."

In its suit, the EEOC claimed IBM "has intentionally engaged in unlawful employment practices against blacks in the state of Maryland at each of its data processing facilities in violation of ... the Civil Rights Act of 1964."

The action grew out of a complaint by former IBM employee George Hunter that he had been denied promotion to branch manager "on the basis of his race and despite his superior performance in executive positions."

The EEOC said the firm had refused

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IBM Says No Hazard

EPA to Test 3800 Printer Chemical

By Ann Dooley
CW Staff

WHITE PLAINS, N.Y. — Laboratory testing has revealed a possibly hazardous chemical in the IBM System 3800 printer, but IBM maintains it is of no danger to users.

IBM has notified its customers about the existence of the chemical in the printer's photoconductor process in a letter that assured users there is no health hazard involved.

The chemical — Trinitroflorinone (TNF) — was found to induce cell changes in laboratory animals in experiments conducted by IBM researchers during routine testing.

TNF, according to an IBM spokeswoman, may come into contact with the printer's toner, which is subsequently deposited on the printed page. Trace amounts of the chemical may remain on the output copy and might from there be transmitted to persons operating or servicing the machines.

IBM maintains, however, that the amount — estimated at a maximum of three micrograms per page — would be too small to pose any health risk to humans.

In addition to its existence in the 3800 high-speed nonimpact laser printer, TNF is used also in the IBM Copiers One and Two.

IBM, which conducts the ongoing laboratory tests as part of its routine development process, also reported its findings to the Environmental Protection Agency (EPA) as required by law under the Toxic Subject Control Act.

The EPA will compile data to determine if any problem actually does exist and what the repercussions of such a problem might be. But until further testing is conducted, EPA is not in a position to determine what, if any potential hazards there might be, according to the agency's policy regulations.

The reporting of a chemical's existence is fairly routine because the Toxic Substance Control Act requires a low triggering base for data, which results in generalized and often inconclusive findings initially, according to an EPA Assessment Division staff member.

The reason for obtaining data at such a preliminary stage is that it is advantageous to the agency to have that information early if a problem should occur. But final conclusions may be entirely different from the initial findings, he stated.

Since the act went into effect in 1977, 340 cases have been reported to the EPA. Although several in-depth assessments have been made, no chemical has had to be regulated because of its effects, the EPA spokesman said.

The agency, with the help of IBM, will prepare a status report concerning TNF in IBM equipment as soon as more data is available.

CDC 205 Gives 800 Mops

(Continued from Page 1)

stack and a 256-word register file.

The vector (parallel) unit performs arithmetic operations on arrays or streams of data and consists of one, two or four segmented pipelines, allowing for a new set of 32- or 64-bit operands to be streamed directly to and from central memory into each pipeline every 20 nsec, according to the company.

A maximum of four million 64-bit words comprise the 205's central memory, and CDC maintained that data is transferred between central memory and the central processor at speeds up to "25.6 billion bit/sec for each million-word increment of central memory."

A basic Cyber 205 system features eight I/O ports expandable to 16, and each of them has a maximum transfer rate of 200 million bit/sec, CDC said. Up to two trillion words of virtual memory are offered to each user.

The Cyber 205 runs under Cyber 200-OS software, which allows users to access the system from remote batch or interactive terminals or through local devices via front-end processors.

The Cyber 205 systems are priced from $7.9 million to $16.5 million in "typical configuration" and will be available for shipment in January 1981, according to the company.

Target Applications

Who needs it?

"Ten years ago," the spokesman said, "applications which fell into the supercomputer spectrum were essentially either nuclear or high-energy physics problem solving."

Additional target applications which require number-crunching capabilities involve search for new and alternate energy sources, the production of long-range weather forecasts and the design and manufacture of aircraft.

The petroleum industry requires "huge computing power" to process seismic data form exploration activities and to simulate reservoirs for maximum oil produciton — one possible application for the 205, the spokesman said.

"The [supercomputer] market is growing at a faster rate than any other [computer market] is absolute terms," the spokesman said. He acknowledged that he was comparing an increase from "perhaps five to 50 supercomputer installations" to something like the minicomputer market "where you might go from 1.5 million to 2 million [machines sold]."

This Week

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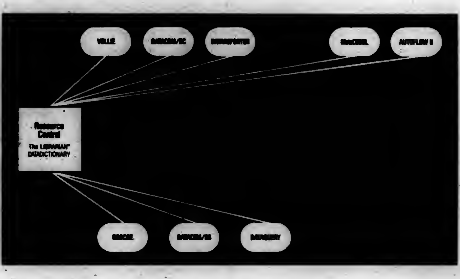

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States Skeptical of FBI Plan to Decentralize CCH

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — The Federal Bureau of Investigation's plans to decentralize its Computerized Criminal History (CCH) program have been received by state criminal justice officials with a mixture of hopefulness and skepticism, with the emphasis on the latter.

Several state law enforcement officials contacted by *Computerworld* reacted to the latest CCH plan of the FBI's National Crime Information Center (NCIC) by saying, in effect: "It sounds good, but I'll believe it when I see it."

"It's the same old thing. I don't think anything they [the FBI] do is going to affect anybody," said one observer with a cynicism born, he said, of more than 10 years of start-and-stop FBI efforts to develop a truly national law enforcement telecommunications system.

The object of this cynicism is a recently announced NCIC proposal to discontinue maintenance of a central on-line data base on multistate offenders — persons with felony records in more than one state. Local police agencies would obtain those records directly through a state-controlled network rather than through the FBI [CW, May 26].

Previous FBI plans to maintain the multistate offender file and to route interstate police communications have met with congressional resistance to what is seen by some as federal interference in state law enforcement and by reloctance of states to shoulder the costs of opdating a Washington, D.C. data base that essentially duplicates state-level files.

Nlets Link

Under the proposal, the NCIC would put up an Interstate Identification Index (Triple-I) that states would access to see where criminal records are maintained on any given suspect. The states would then communicate through the state-owned National Law Enforcement Telecommunications System (NLETS) to arrange record transfers.

FBI officials conceded that NCIC message-switching proposals have become politically untenable and have become mired in endless controversial attempts to replace old and unreliable NCIC hardware. They insisted, however, that their present decentralization effort reflects a long-standing policy of state control of criminal records exchange.

Full decentralization is possible now only because NLETS is increasing its DP capacity, according to Lawrence Lawler, NCIC section chief.

While it is true that the Phoenix-based NLETS is replacing its aging Data General Corp. Nova 840 systems with Digital Equipment Corp. PDP-11/70s, NLETS users and officials argue that the system has always had the capability to operate a full national communications system.

Adding to their suspicion about NCIC motives are CCH user complaints that the Triple-I system has been discussed for years with little or no action. For its part, the FBI complains of constant congressional interference and lack of state cooperation that have, the bureau said, made it impossible to upgrade system capabilities.

NCIC's Lawler, for instance, noted that the original 1966 NCIC system was developed in assembly language and "patched ever since." Also, the system's IBM 360/65 mainframes, replaced last week with National Advanced Systems Co. AS/5, presented incredible maintenance problems, he said.

Pilot Delayed

Symptomatic of NCIC's difficulties is that the Triple-I pilot program, originally set for this summer, faces at least a year's delay because the NCIC advisory board wants the project to include manual as well as automated file exchanges.

The delay is dismaying to potential Triple-I users at the state level, who are painfully aware that the NCIC plan to add one state at a time to the system — and that only after careful analysis — could add years to full Triple-I implementation.

And all parties are aware that Congress could throw a huge monkey-wrench into the project at any time. The Congressional Office of Technology Assessment is completing an in-depth study of NCIC options, and a bill moving through the Senate calls for an advisory panel of federal, state and local law enforcement officials to recommend future NCIC policy.

FBI officials, including Lawler, insisted they welcome such scrutiny and said they recognize the need for a firm systems development plan for NCIC. But state criminal justice representatives contacted by *CW* said NCIC efforts will be successful only if a better federal-state working relationship can be arrived at.

The distrust that presently characterizes that relationship is illustrated by the fact that every state official contacted requested anonymity. "The FBI can come down on you if they don't like your statements," said one. "In a paramilitary organization, the 'peons' just don't make critical statements."

Bulletin

WASHINGTON, D.C. — AT&T's proposed 5% rate increase was granted by the Federal Communications Commission at press time. (See details on Page 39).

U.S. DP Able to Handle Gas Rationing?

(Continued from Page 1)

pleted, it would take 90 dyas to implement, according to Welman.

DOE officials, for their part, don't dispute Welman's assessment of the time frame involved in instituting gas rationing but insist their studies indicate a rationing program could be carried out with facilities already in place, augmented by DP service organizations.

The DP capacity question is not likely to be resolved soon, however. DOE expects to present Congress with a rationing bluprint within the next month to support its request for $80 million to develop a final plan. Then the department will need an estimated 12 to 18 months to work out the details, DOE officials told *Computerworld* recently.

Although the slowly emerging plan is, according to DOE, rather broad — "so vague it seems unworkable," in the view of the ABA task force — the department is confident it can come up with a finished product if given time.

The first task, according to one DOE official, who asked not to be identified, is to decide how to structure vehicle registration data base because gas allocations would be based on the number of vehicles registered in each state, with each owner being allotted a certain amount of gasoline according to available supplies.

Unresolved Questions

Unresolved questions include whether the government should assemble a national data base or administer the plan on a state level using existing files. "We have determined that all states except Idaho [which has manual files] can deliver a [magnetic] tape in a common format," the DOE official said, adding that the quality of those tapes is a "central problem."

States differ in how often they update their vehicle registration files, how they handle backlogs, changes of address and other aspects of file maintenance, he noted. With a million vehicles sold every month in the country, updating represents a considerable problem, rationing officials admit.

The next hurdle in the "preimplementation phase" of the rationing plan may be even more formidable — printing and issuing "ration checks," possibly magnetic ink character recognition (Micr) encoded, to the 150 million vehicle owners in the U.S. The ABA's Welman has serious doubts that sufficient printing capability exists in this country.

Managing the plan once implemented, in itself a huge job, would also require massive amounts of automation. One popular scenario calls for something referred to as ration banking accounts, which explains the long-time ABA interest in the DOE planning process.

Under this plan, rationing checks would be mailed to vehicle owners, who would redeem them for coupons, probably at the 40,000 existing bank branches and possibly at other financial institutions or government offices.

Gasoline service station operators would collect the coupons for gasoline sold and deposit them at local banking offices, which would forward them to regional processing centers. Deposit receipts, issued in gallons rather than dollars, would be used by the operators to purchase gasoline from suppliers.

Ration banking could overwhelm bank facilities in many areas of the country, according to Welman, although reliance on regional processing centers — perhaps 12 to 15 in all — would spare bank DP departments the burdens of counting the coupons and recording the ration account transactions.

Welman envisions the processing centers as similar to existing facilities that handle the DP chores of smaller banks around the country. Banks themselves and DP service organizations would be most likely bidders for supplying these processing services, he suggested.

According to the DOE, contracting for these services is just one of many details to be sorted out in the planning process. The department has determined, the DOE official said, that a national vehicle registration file could be handled by two or three IBM 3033 mainframes, for instance. But DOE is a long way from making that kind of decision. "We're not in a procurement mode at this time," he said. "We don't know how we want to set the system up."

The department has consulted with DP companies — IBM was mentioned as one source of advice — and conducted studies of existing facilities, according to DOE. "We have all the information, but it has to be sorted and analyzed," the department source said.

In addition, various network configurations have been discussed with AT&T, he continued. "If you have a couple of years [to ready the plan] you might go with a very sexy system such as an on-line system." But, he added, "these things cost an awful lot of money" and "we're trying to get the best system for the least amount of money."

Final decisions await congressional funding of the planning effort. But some observers feel that swift congressional action seems doubtful because previous DOE plans have been rejected by Congress, the present proposal is so vague and the memory of last year's long gas lines is receding.

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Is Automation the Answer?

Experts Divided on Cure to Productivity Lags

By Marguerite Zientara
CW Staff

WAKEFIELD, Mass. — U.S. productivity is lagging, but not everyone agrees that automation will improve the situation.

At Arthur D. Little, Inc.'s (ADL) Third Biennial Executive Forum for Impact Clients here last week, ADL staff members demonstrated varying degrees of optimism and pessimism toward automation of business systems, computer-aided design/computer-aided manufacturing (CAD/CAM) and "the office of the future."

Subscribing to the inevitability of business automation, Robert L. Fronk, senior member of the Information Systems Section, said there are 18,000 documents and four file drawers for each of 18 million white-collar workers in the U.S. With the rate growing at one file drawer and 4,000 documents per employee per year, Fronk pointed out the need to enhance management and supervisory productivity.

Suggested Remedies

As for methods for accomplishing that end, Fronk suggested controlling increased business complexity, accommodating social change, controlling inflated costs and investing in technical solutions.

To accommodate social change, management must recognize ongoing demographic changes, changing lifestyles and higher career aspirations. "There are fewer entry-level workers today but two-plus workers per family," Fronk noted, "besides a high annual turnover rate of 40% and a higher education base."

Driving economic forces include a 7% yearly increase in labor costs, a 20% increase per year in energy costs over the last five years, a 40% yearly dec.ease in memory costs over five years, a 20% annual drop in electronics costs over five years and a drop in communications costs of 10% per year.

"The things with which we make products are decreasing in cost," Fronk noted, "but the things we make are increasing in cost." Furthermore, as much as 80% of personnel costs go toward management, leading to questions about efficiency and a strong impetus for increased office automation.

Among business forces pointing toward automation are the need to increase managerial productivity through timely handling and processing of appropriate amounts of information and increasing business sophistication that calls for more complex analysis and more information management for decision making, Fronk said.

In addition, conglomerate diversification, costly government reporting and the expensive and inefficient manual mail system call for automated information handling, according to Fronk.

Finally, more sophisticated intelligent office products with better price/performance ratios, upgraded communications common carrier systems and software that is "more mature and user-friendly" make it more logical to invest in technical solutions, Fronk said.

Taking the optimist's view that technology is the answer, Norman S. Zimbel, head of Distributed Systems unit, described the implications and possibilities inherent in the key technologies of microelectronics and microprocessors, mass storage, laser and other non-impact printing, local area broadband communications, satellite communications and applications software.

Word processors make possible enhanced quality, efficiency and control of text handling. Intelligent copiers and printers enable consolidation of convenience copying, hard-copy distribution of electronic mail and in-house "distributed publishing," Zimbel said.

"For under $10,000, the small businessman can acquire a small business system that will give him local control of 'personal' computing," Zimbel added. And communications products have established a base for the upcoming communications terminal, electronic mail, communications cost control and teleconferencing.

"While automation implies large investments in equipment, staff training, reorganization and organizational trauma," Zimbel conceded, "the payoff in the 1980s will be the ability to cope with increasingly complex business practices and competitive pressures."

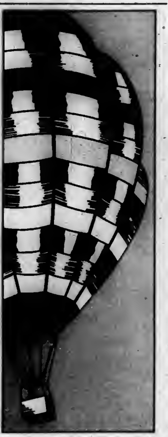
Disagreeing with that optimistic viewpoint was Richard E. Heitman, senior vice-president of corporate services, who claimed that technology "has outstripped our capacity to implement its products intelligently."

Some of the more advanced forms of office automation are particularly hard to implement because in a typical organization the number of managers involved is large, Heitman noted.

For example, staff would be necessary from the office area, the report center, DP, telecommunications and training. "Ideally, the manager of all functions involved should take responsibility for coordination.

"Unfortunately, these functions often come under a common manager only at the Chief Executive Officer

(Continued on Page 6)



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Turning to Consultants, Packages

DP Recruitment Tougher for States This Year

By Tom Henkel
CW Staff

LEXINGTON, Ky. — State officials thought it was rough recruiting DPers last year. It's worse this year.

High competition for qualified DPers — much of it from firms that can afford to pay more than state governments — has caused some drastic changes in the way state government information systems are managed, according to the 10th annual report of the National Association for State Information Systems (Nasis).

States are now being forced to hire more outside consultants and buy more canned software to meet their processing needs, the Nasis report said. As a result, state DPers are finding it somewhat easier to meet programming schedules, but said poor systems and inadequate documentation are becoming more severe problems.

As expected, most state DPers pointed to management as the crux of their problems. A lack of management commitment, understanding and interest ranked high on the list of the problems, the Nasis report said.

"The most dramatic change noted in expenditures is the increase in the percentage made for consultants," the report said. That figure jumped from $12.7 million in fiscal 1977 to $23.6 million during fiscal 1978, or 4% of the total DP expenditures.

In addition, surveyed DPers said they expect expenditures for consultants to grow to 5% of the total budget during fiscal 1980, according to the report.

The purchase of canned software, particularly for special projects and data base management, is also on the rise. For example, 19% of state DPers polled said they are using software developed out-of-house for specific projects, and 13% said they are using outside data base management packages.

Other canned software being purchased includes library management programs, source deck control packages and systems balancing software, according to the report.

The total state budget for information systems was estimated at $1.4 billion — an 8% increase over figures for fiscal 1978.

During 1979, states spent an average 31% of the total DP budget for hardware, 46% for personnel, 4% for consultants, 1% for software, 2% for communications — the first time that category has been considered separately — and 16% for "other."

Projected average expenditures for fiscal 1980 are 31% for hardware, 45% for personnel, 5% for consultants, 1% for software, 2% for communications and 16% for "other," Nasis said.

Increased costs for consultants plus an average 1% increase in hardware costs have prompted states to take a proportionately bigger bite out of their respective state budgets for DP. "Higher expenditures for personal services and payments to individuals and political subdivisions in the total state budget, brought on by inflationary pressures, have caused this," the report said.

Jobs, Training

Although states reported difficulty in recruiting qualified personnel, the impact of that difficulty may soon level off. The report noted that the growth rate for DP jobs has stabilized at about 4% to 5% a year.

Jobs classified as "managerial" showed a slight increase, but the report theorized that this was because more employees are being given additional responsibilities such as managing data bases, networking and security functions.

"There has been a marked decline in the percentage of jobs assigned to data entry," according to Nasis, which is not quite sure of the reasons for that decrease. The group theorized that the drop may have been a result of more data entry people being classified as supervisory personnel at sites with a stand-alone minicomputer connected to a distributed network. The group also said the drop could have occurred because states are finding other ways of entering data.

The difficulty in recruiting state DPers was also reflected in training. The total number of courses offered by state government rose 8%, but the number of internal courses increased by 75%.

Although states paid more than $4 million for training in 1979 in hopes of keeping their DPers, fewer employees were taking advantage of those state programs. For the 6,290 courses offered, 20,852 people attended.

Employees were also apparently becoming more selective in choosing training programs. DP management, systems analysis and systems programming courses increased in attendance, while data entry and operating training programs declined. The report attributed this change to the installation of new families of hardware and to different methods of programming.

System Configurations

While the face of state DP professionals is changing, so, too, are state hardware configurations. Minicomputers are fast becoming the mainstay of state computer systems. A total of 87 new systems were reported in 1979. About 70% were minicomputers.

In addition, although minicomputers began gaining ground in state shops, the growth rate for larger mainframes remained virtually unchanged throughout the past year at 28% of the total number of CPUs, Nasis said.

Possibly because minicomputers are cheaper than larger mainframes, state DP shops tended to buy them rather than lease. Combination lease and purchase deals were also favored. Of state DPers polled, 46% said they would lease hardware, while 54% will either purchase systems outright or through a combination lease and purchase deal. Third-party leases were not included in the survey, Nasis said.

'Courting Catastrophes'

State computer systems were also way behind the times in developing security and privacy systems. "We are courting potential catastrophes of great dimension" is something Nasis has been saying in every report it has issued since 1973.

Since more people are exposed to state computer systems than ever — because there are more distributed systems and stand-alone minicomputers — the risk is even greater than in 1973, this year's report said.

Asked what external factors most impact state DP shops, respondents ranked recruitment of new DPers highest. Other problem areas included a need for documentation, a lack of management commitment and a lack of a definitive plan for the DP department, according to the report.

As the internal problems most impacting the DP department, poor systems and inadequate documentation ranked tops.

The complete Nasis report is available for $25 from the association at P.O. Box 11910, Lexington, Ky. 40578.

Experts Report Mixed Views On Curing Productivity Lags

(Continued from Page 5)

level, but the CEO will spend only a little time on the project," Heitman said.

With these factors in mind, those who would automate must plan the process, acquire managerial commitment for change and stand fast on the expected savings "despite the 1,001 arguments that cost savings can't be achieved," Heitman said.

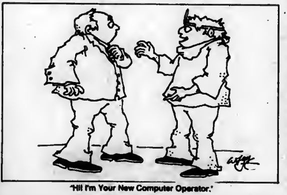
'Grand Strategy'

The recommended "grand strategy" for automation boils down to adopting an open mind toward change and experimentation, according to Vincent E. Giuliano, senior staff member in Information Systems.

Recognizing that the basic barriers to automation are not technological but rather involve "the fundamental natures of individuals and organizations," management should try to transform individuals into its greatest assets, Giuliano said.

The overall plan for the 1980s in automation is to "build top-down awareness through corporate-level technology-based strategic planning," and create an environment for learning, according to Giuliano.

The learning environment should "start out where the organization and individuals are, feel relatively unthreatening to workers' sense of territoriality and should encourage people to look at old things in new ways," he recommended.



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TEC

Data Base Stores Congressional Voting Records

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — With many political candidates using computers to further electoral ambitions this year, it should come as no surprise that their would-be constituents, financial backers and, of course, opponents, are also using DP systems to investigate the current crop of vote seekers.

One example of this tit-for-tat, bit-for-bit trend is the growing popularity of "Legi-Slate," an on-line data base offering instant access to the voting records of every member of the U.S. Congress.

While senators and congressmen deploy sophisticated computerized mailing lists, DP-based contribution drives and campaign management information systems, their past performance is flashing across CRT screens operated by those seeking to unseat them this fall.

Offered through the packet-switched network of Canada-based I.P. Sharp Associates, Legi-Slate offers rapid, on-line access to data on bills and resolutions introduced by every member of Congress and their complete voting records as well. And because it is written in APL, Legi-Slate can be used by almost anyone with minimal instruction, according to Charles T. Cudlip, head of Legi-Slate of Congress, Ltd.'s office here.

Opposition Research

Legi-Slate was designed to help lobbyists, corporations and government entities keep track of congressional activity of interest to them. But in an election year, every bit of data can be used as a bullet.

The Republican campaign committees of both the House and Senate are using the service for "opposition research" — seeking voting records information that can be used against incumbents in this fall's campaigns, Cudlip said.

"We can do in minutes what people are spending multihours to do in terms of voting profiles," Cudlip said.

Numerous corporations, law firms and other organizations that control political action committees (PAC) are using the system to decide how to distribute campaign contributions, Cudlip said.

Users can generate reports showing which members of Congress backed specific legislation and can list backers geographically, in relation to one another, to how the party leadership voted or according to any number of ranking schemes, be said.

PAC officials can then determine what candidates to support based on objective data, not just on campaign promises or party affiliation, Cudlip remarked.

With PAC-controlled funds approaching the $100 million mark this year, he said, the voting analyses available through Legi-Slate could have an enormous impact on campaign financing.

Available since February, Legi-Slate now has more than 50 subscribers and has generated tremendous interest, according to Cudlip. A number of government agencies are reportedly scrambling to get onto the system.

Present subscribers include the White House, the Departments of State and Treasury, the Veterans and Small Business Administrations and various trade associations, law firms and corporations.

Subscriber Services

There is a $130 minimum monthly charge to Legi-Slate customers, good for one hour each month. Additional hourly costs descend to $99 for the fifth and each additional hour. Potential subscribers without terminals of their own can obtain equipment through Legi-Slate for about $60 a month, Cudlip said.

Subscribers can also store any number of special Legi-Slate files at no cost.

According to Cudlip, "an average bill-tracker" — an organization interested in perhaps only a few dozen pieces of legislation — can get all the information it needs in about four minutes daily on the terminal. Legi-Slate directs users to the page in the *Congressional Record* containing the desired information.

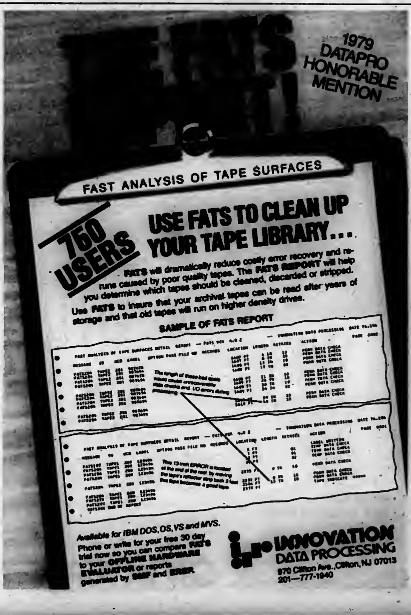
The system "eliminates the tedious task of searching through the *Congressional Record*" by listing items according to some 600 key words. A subscriber interested in oil drilling, for example, can quickly learn of any new bills introduced in that area and actions on pending bills.

A user can also check the congressional calendar through the system for upcoming action — such as votes, hearings, committee and subcommittee meetings — he should be aware of.

Modeled on a similar system the firm developed on the *Texas* state legislature, Legi-Slate took five years to put together, Cudlip said. The firm is actively considering expanding the system to other state legislatures and will have available next year a similar service digesting the *Federal Register*.

Legi-Slate is updated daily from the firm's offices here. Information from the *Congressional Record* and other sources is transferred on-line to the I.P. Sharp data center in Toronto, where the data base is maintained on an Amdahl Corp. 470/V8 system.

But with more than 11,000 bills and resolutions already before the 96th Congress, storing the data base is becoming so expensive that the firm will most likely acquire its own mainframe sometime soon, Cudlip said.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Prime Readying Log-On Software, Users Told

By Jeffrey Beeler

CW West Coast Bureau

SAN DIEGO — Prime Computer, Inc. plans in the relatively near future to start supplying "log-on" programs to help prevent unauthorized users from gaining access to its customers' systems and files.

Word of the expected offering came last week from Prime's operating systems group manager Michael Strong, who delivered a few impromptu remarks during a session at the company's fourth annual user group meeting.

Strong declined to indicate exactly when the access-control software is expected to be introduced other than to say "it probably won't be available this year." But whenever it makes its debut, the product is likely to get an enthusiastic welcome from many Prime users.

When news of the company's intention to offer a log-on program leaked last week, many of the users in Strong's audience broke into spontaneous applause.

The availability of Prime's first log-on program means customers who want to control user access to their systems and data files will no longer have to write their own software to do so.

Strong's disclosure of Prime's proposed log-on program capped a systems-security session chaired by Buzz Dreyer, a University of California at Riverside (UCR) faculty member. Strong also used the session as an occasion to reveal Prime's intention to modify its user-registration procedures.

The modification will reportedly allow users for the first time to log on to the company's systems without ever gaining access to high-level user file directories (UFDs).

Security Breach at UCR

Earlier during the session, Dreyer illustrated the importance of maintaining systems integrity by citing an example of a security breach that occurred several years ago at UCR's computing center.

The breach was made possible when a disgruntled Prime employee gave a southern California computer hobbyist the telephone number of UCR's main processor, a 1M-byte Prime 400 with a 300M-byte disk pack and 51 user terminals. Using his own Radio Shack TRS-80, the hobbyist penetrated the CPU and spent about 20 minutes perusing its files at will before the invasion was finally detected, Dreyer said.

How did the intruder gain access to the campus processor so easily? "We had no log-on screening programs and no passwords to protect the system's integrity," Dreyer explained. "It was completely open to anyone with the phone number." Since then, however, the system's security has been tightened considerably.

Installing, Running 4300 Baffling Users

(Continued from Page 1)

ice systems programmers, to go out and buy more disk drives rather than trying to recover space used by the Sysgen, Ennever claimed.

On the positive side, Ennever said IPO/E can be a boon to DPers without extensive system programming background. However, he questioned IBM's reported claim that a 4331 CPU can be installed and maintained without a systems programmer.

Since IPO/E tapes tailor a user's system libraries to fixed addresses in a disk memory, changing those addresses in efforts to retrieve disk space could cause more problems than it is worth. When users try to use monthly program update (PUT) tapes, they have to restore the system libraries to their original addresses for the tapes to work, Ennever explained.

IPO/E Tapes

While IBM notes IPO/E tapes are tailored to a user's specific configuration, Ennever said that is not the case. IPO/E tapes come in two forms: the IPO/E base and an IPO/E features tape. IPO/E base includes required program products and is divided into three categories; batch interactive (B/I), batch interactive with data communications (BI/DC) and batch interactive with data base/data communications (BI/DB/DC), Ennever said.

The features tape includes optional program products selected by the user, he added.

There are problems, however. Some optional program products, such as Vtam/E and the OS/VS1 operating system, are not supported by IBM's IPO program. That means users without systems programming experience would be forced to generate those packages manually.

In addition, jobs submitted during the Sysgen process can fail even if the IBM software generating those jobs is correct. That would mean a user without systems programming experience could find himself in a position he could not get out of without a systems programmer's or IBM's help, Ennever said.

Fixed-Block Architecture

Since the 4331 employs a fixed-block architecture (FBA), meaning block length is a constant 512 bytes as opposed to a variable length as in other IBM systems, programming the 4300 line should be easier because programmers no longer have to worry about cylinder, head or record numbers when locating data.

Instead, programmers need only the block number. However, for a 4300 system running in a 370 mode under the OS/VS1 operating system, neither FBA support nor IPO/E support is offered, Ennever said.

Although OS/VS1 can operate on both 4331 Model Group 1 and 2 and 4341 processors, the lack of IPO/E and FBA support for that operating system suggests IBM is trying to force its clients into a DOS-oriented environment, Ennever said. That statement caused some dismay among former 370-era DPers who switched from the old 360 DOS environment to the 370's OS because it offered a more efficient method of processing.

Now those users say it would be too expensive to convert out of the OS environment back to DOS under the improved VSE. At least one group of such users, representing a major New York City bank, vowed to stay in an OS environment regardless of IBM's reported wishes.

IPO support is available for 4300s running OS/VS1 in a 370 mode, according to IBM.

MVS, the most powerful version of IBM's OS/VS2 operating system, will never be supported on the 4300 line, Ennever said. While 4341 users have expressed an interest in using that operating system, IBM will offer a combined version of DOS/VSE and VM that will possess similar processing capabilities. However, use of that operating system will also require an OS to DOS conversion, Ennever pointed out.

PCM Systems

While several manufacturers are offering plug-compatible mainframes (PCM) to the 4300 line, Ennever said switching to those systems would be an unwise decision.

IBM seems to have the deck stacked in its favor in that it will not offer IPO/E support or system control program support to PCM machines. That could cause PCM users some hardships if IBM were to make changes to basic 4300 hardware or software, Ennever said.

For the future, Ennever predicted IBM will unbundle more of its program products to generate added software revenue.

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EEOC Charges Discrimination Against IBM

(Continued from Page 1)

to evaluate Hunter in a "timely" manner and had lowered his performance rating after he complained.

Further Charges

The suit charged the company with maintaining discriminatory performance evaluation policies and practices, failing to post notices of managerial and professional vacancies, and failing "to develop and employ nondiscriminatory criteria which accurately measure the performance of professional and managerial personnel."

The commission asked the U.S. District Court here to direct IBM to end its allegedly discriminatory practices and to award Hunter "the next available branch manager position."

The complaint also asked that Hunter be awarded back pay with interest.

To Maintain U.S. Lead

SBS Urges Federal Funding for Communications

By Phil Hirsch

CW Washington Bureau

WASHINGTON, D.C. — Another industry executive advised Congress late last month to increase federal financial support of telecommunications research and development.

The money should be spent on improving satellite launch vehicles, spacecraft and earth stations, as well as developing better signal processing and modulation techniques, said Robert C. Hall, president of Satellite Business Systems (SBS).

"If the U.S. is to continue to be a world leader in the development and marketing of satellite communications technology and systems," he added, "the U.S. government as well as private industry must actively support communications research and development."

Hall offered this advice to two subcommittees of the House Science and Technology Committee that have been considering how the government might encourage innovation in communications technology.

Several other U.S. developers and marketers of telecommunications systems, services appearing earlier before the same group said essentially the same thing. Implicitly or explicitly, all the speakers told the congressman that the National Aeronautics and Space Administration (Nasa) needs more money for its communications R&D program.

The House Science and Technology Committee has authorized $30 million for this activity in fiscal 1981, which begins next October. While the sum is considerably more than Nasa has received for several years, this funding is far less than Congress provided in 1973, when the threat of foreign competition was not nearly so apparent.

Teletext Test

The hearing at which Hall spoke was the last of four convened by the two subcommittees. Another speaker at that meeting — Philip A. Rubin, research director of the Corporation for Public Broadcasting (CPB) — described plans for "the first large-scale American test of a broadcast teletext system."

The test will be conducted by WETA, the Washington, D.C., public TV station. About 50 commercial TV sets, located in homes and public buildings within the Washington Area, will be linked via over-the-air TV broadcast channels to a 100 to 400 page computerized data base.

"As the project moves ahead," Rubin explained, "we expect to add considerably to the number of decoders in the hands of viewers and to make decoders available at the lowest cost to those who wish to take advantage of this demonstration service."

The decoder is a microprocessor-equipped black box that interfaces the TV set to a channel carrying teletext information in binary form. The decoder, among other functions, converts the incoming bits into the display that appears on the TV screen.

Although the WETA test is not scheduled to begin until January, it may in fact, get started early next November, Rubin said, in time for the upcoming Presidential election. In that case, up-to-the-minute returns from each state and national race will be stored on separate teletext display pages within the computerized data base.

Each participant in the test, by inputting a simple code into his decoder, will then be able to access any of these pages. "This could be a vivid demonstration of the technology's capability," Rubin said.

The WETA test may also involve "full-channel" teletext broadcasts before and after the station begins its regular operation each day. The data base would then be accessible to viewers without decoders, the CPB official explained.

In addition to Hall and Rubin, the two House subcommittees also heard from Dr. Edwin B. Parker, vice-president of Equatorial Communications Co. which develops satellite data communications systems for sparsely populated areas.

He said the U.S. should finance high-powered satellites capable of delivering social services via low-powered earth stations to developing countries. Most of these countries, he explained, do not have the $100 million to $200 million needed to launch such satellites on their own, and existing satellite communications systems are not suitable for such applications. They employ low-power spacecraft that require large and expensive ground antennae, he explained.

The benefits of using satellite technology to deliver social services to poor areas are suggested by what happened in Alaska, he added. A satellite-based communications network has been delivering health care services there for some time to Indians and Eskimos living in rural areas. Their health has improved significantly as a result, said Parker.

Alaska's satellite-based health care service is now permanently established largely because rural Alaskan voters were able to mobilize sufficient political pressure and the state had sufficient money to deploy the systems.

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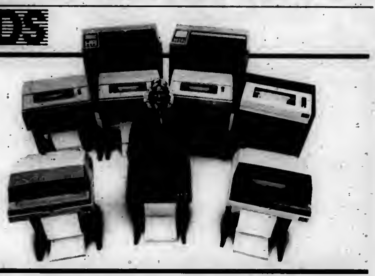

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Five Firms Form National Software Commission

WASHINGTON, D.C. — Five computer industry associations joined forces to form a national commission that will investigate software issues.

The founders are the Data Processing Management Association (DPMA), the Association of Data Processing Service Organizations (Adapso), the Computer Law Association (CLA), the EDP Auditors Foundation and the Association of Education Data Systems (AEDS).

Called the Commission on Software Issues in the '80s, the industry panel's charter is to present reports on the social, legal, technical and economic issues that arise through the development, distribution and use of computer software during the next decade.

The commission will focus on such areas as taxation, copyrights, liability, standards and security. The group stressed it will conduct objective research projects; but rather than recommend solutions to any problems, the goal is to identify the parties involved and competing interests to stimulate efforts to resolve issues.

Plans are to create issue task forces to conduct and collate the research and to prepare draft reports on issues for review by the commission.

Sponsoring associations selected the following individuals to serve as founding members of the commission:

- J. Crawford Turner, ex officio chairman, who is the international vice-president for planning and research development at DPMA. He is employed by the Knoxville Utilities Board, Knoxville, Tenn.
- Jay T. Westermeier, a DPMA Washington, D.C., member and an attorney with the Washington firm of Abrams, Kovacs, Westermeier & Goldberg.
- Jerome L. Dreyer, executive director of Adapso.
- Michael S. Keplinger, with the CLA, is an attorney and chief of the Information and Reference Division of the Library of congress. Formerly, he served as chief counsel to the National Commission on New Technological Uses (Contu).
- Tommas J. Koehler, a member of AEDS, is director of the division of Systems Development for the Montgomery County Public Schools, Montgomery County, Md.
- Gene Shaeffer, member of the EDP Auditors Foundation.

Information about serving on the commission or contributing source material and research to the investigative phase of the commission's project is available from Steve Jost at the DPMA Washington Office, 734 15th Street N.W., Washington, D.C. 20005.

Bucknell Confers Degree On Capt. Grace Hopper

LEWISBURG, Pa. — Bucknell University recently conferred an honorary Doctor of Science degree on Capt. Grace Brewster Hopper, U.S. Naval Reserve, along with three other individuals in other fields.

Hopper serves on active duty at the Pentagon and works with the Department of Defense on various projects, including higher level languages for minicomputers and computer security problems.

A mathematician, Capt. Hopper joined the Navy in 1943 and spent several years during World War II learning to communicate with Mark 1, the prototype of today's computers. Since 1946 she has had varied assignments: at Harvard University, with the Univac Division of Sperry Rand and at George Washington University. She also helped pioneer the current method of computer programming, most noticeably by devising a compiling system which serves as a translator between human and machine.

An alumna of Vassar with a Ph.D. from Yale, Capt. Hopper has taught mathematics at her alma mater, has been a member of the Harvard faculty as a research fellow in engineering sciences and applied physics at the computation laboratory, taught at the Moore School of Electrical Engineering at the University of Pennsylvania and was a lecturer in management science at George Washington University.

She has received numerous honors and awards including the Data Processing Management Association's "Man of the Year." Capt. Hopper has published more than 50 papers and articles on software and programming languages.

Others honored were Rosabeth Moss Kanter, sociologist, professor of organization and management at Yale and noted author; John Lindsley, professor of psychology at Harvard; and David Russell Burger, concert pianist and chairman of the piano department at Eastman School of Music.

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Presidential Office's DP Outlays Expected to Hit $10 Million in 1980

By Marguerite Zientara
CW Staff

WASHINGTON, D.C. — The Executive Office of the President (EOP) expects to spend $10 million in 1980 for information processing services out of a total budget of $93 million — a percentage that is higher than the governmentwide average.

Attributed to "the nature of the environment" and "the amount of analysis performed," such a higher percentage translates into a complex series of computer systems used by a total of 1,600 people in the 11 agencies within the EOP.

But the system was not always so sophisticated. The concept of the EOP started with President Franklin Roosevelt 40 years ago, when widespread computing was just a dream. The President's information needs were then less complex than they are today, according to Richard M. Hardin, special assistant, to the President for information management.

As director of the Office of Administration (OA), Hardin has overseen a veritable revolution in the EOP's use of DP, designed to bring the President and his staff in line with today's technology with an eye to the future as well.

After working with Arthur Andersen & Co. in its systems area and for then-Gov. Jimmy Carter in Georgia — both in DP and as Commissioner of Human Resources "for a couple of years" — Hardin came to the White House with the new Administration in 1977.

Reorganizing the System

Noting "the increasing involvement of government in all aspects of our lives combined with the increasing number of groups who feel they should be involved," Hardin concluded the "old boy network" was no longer able to handle the volume and complexity of the available information.

Information to the White House is filtered through Presidential advisers whose effectiveness is measured in terms of the number and complexity of initiatives each implements, Hardin noted. At any point in time there are 15 to 20 Presidential, 150 to 200 Administration and several thousand departmental initiatives.

To implement all these, advisers must rely on massive volumes of data, trying meanwhile to keep current, validate any information received, analyze new data, coordinate information and communicate new ideas to the appropriate people.

Traditionally, each adviser cultivated and maintained his own network of experts in certain areas to keep him up-to-date on the issues. Such networks were time-consuming, cumbersome and often ineffective.

With an eye toward benefiting Presidential advisers and as part of the reorganization of the EOP that occurred soon after he took office, Carter created OA in December 1977. After more than two years' evolution, the current organization consists of Director Hardin's office and six divisions.

Besides Information Management and Services, Information Systems Development and Computer Facilities Management, the divisions include Personnel, Financial Management and Administrative Services.

First Efforts

OA's first significant effort was the development of the automated Vote Analysis System to help advisers keep track of congressional action on certain legislative proposals. "The success of this system led the congressional liaison staff to ask if we could help keep track of congressional mail, and we developed the Correspondence Tracking System," Hardin recalled.

That system also proved successful and was soon implemented by "several other organizations," he said. "It in turn led to the development of various other small systems for tracking such things as speakers and projects and maintaining lists."

OA has developed a financial management system as well and is using a personnel and payroll system developed and operated by the Treasury Department.

"More recently, we have been working with the Office of Management Budget [OMB] on developing the capability of transferring budget data electronically from the agencies and keeping track of the types of information collected by different agencies in an attempt to reduce paperwork," Hardin noted.

OA is working with the Domestic Policy Staff to develop a system for tracking the progress of the Administration's key initiatives.

"Our most successful interagency system has been the Domestic Information Display System, developed jointly by the National Aeronautics and Space Administration [Nasa] and the Census Bureau," Hardin said.

That system was originally developed to use Nasa technology to display census data "on a more timely basis."

Besides the OA's extensive DP, the White House itself has "several tracking systems, an extensive document preparation system, a time analysis system, various list maintenance systems and some administrative support systems," Hardin noted.

The Vice-President's office has project tracking, events management and a time analysis system. There are tracking systems for the Council on Environment Quality, the Council on Wage and Price Stability, the National Security Council and OMB.

OMB also maintains programs to analyze budget requests submitted by the agencies, analysis of employment figures and stored information relevant to the Privacy Act of 1974.

Within the Office of the Special Trade Representative, various systems have been developed "to maintain files of information on trade activities as well as provide internal administrative support," he added.

In the coming months, OA will undertake five major efforts:

- Improvements of the budget support and other systems for OMB.
- Development of office automation systems and installation of related equipment.
- Implementation of Phase I of a communications network to link the EOP's existing systems.
- Continued development of interagency sytems.
- Expansion of the use of external systems.

System Configuration

Supporting the existing systems are the OA's own Data General Corp. M/600 with 2M bytes of MOS memory, two Itel Corp. AS/5s with 3M and 4M bytes of main memory respectively — both of which systems have a long list of attached peripherals — and a Honeywell, Inc. Level 68 DPS central processor. There are also Datapoint Corp. and Pertec Computer Corp. peripherals.

At the Department of Defense's White House Communication Agency — which maintains "a secure facility for meeting the classified needs of the National Security Council and the White House" — there is an IBM 370/145 Model IH2 with 1.25M bytes of main memory and a Hewlett-Packard Co. 3000 Series II CPU with 512K bytes, both with extensive peripherals.

The Office of the Special Trade Representative maintains its own DG Eclipse C/330 with 512K bytes of main memory and a DG Nova 2110 with 64K bytes.

How Many Payments?

BELLEPLAIN, N.J. — A family here recently learned just how expensive it could be when a computer gets a wrong number.

Several weeks ago, the Atlantic City Electric Co. sent Mrs. Samuel Heaton her monthly computer-generated electric bill. However, when she opened the bill and scanned the amount due column, she discovered that she did not owe the usual $45, but was asked to pay $13,051.

Shocked by the inflated amount and thinking the bill some sort of joke, Heaton called the electric company for an explanation. After some fast DP sleuthing, utility officials there uncovered the root of the digit dilemma. Through a keypunching error, part of Heaton's telephone number was input to the firm's twin Univac 70/45 processors as the amount owed for electric service.

A relieved Mrs. Heaton was just happy to have the whole misunderstanding cleared up. Originally, "an Atlantic Electric secretary told me not to worry. She said I could pay a little off each month."

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Teleram Model 2277 Exonerated

Study Finds No Radiation Danger From CRTs

By Ann Dooley
CW Staff

ROCKVILLE, Md. — Contrary to some recent charges, CRT terminals do not emit harmful radiation, according to the U.S. Department of Health and Welfare's Bureau of Radiological Health (BRH).

Undertaken at the request of Teleram Communications Corp. after its Model 2277 CRT was involved in a radiation-related controversy [CW, April 28], the BRH report exonerated the 2277 from any radiation hazards to operators at the machine or in the workplace.

The BRH report followed closely on the heels of a study carried out at three California newspapers by the National Institute for Occupational Safety and Health. Preliminary findings from that study drew similar conclusions [CW, June 2].

In the BRH study, radiation emissions well below the present government safety levels were measured. Using a sophisticated calibrated spectral analysis technique to chart the radio frequency (RF) emissions at two inches and 12 inches from the surface of the equipment, the BRH found "little reason to expect any harmful biological effects" to anyone using or in the proximity of the equipment.

The units measured — the Teleram 2277 and two Ontel Corp. models — were found to emit the highest levels of RF radiation of any terminals measured by the BRH.

While excess RF radiation in the frequency range of 300kHz to 300gHz may be biologically harmful, the spectral analysis results showed that the CRTs studied emitted frequencies between 20kHz and 125kHz, well below the current safety standards.

The Teleram 2277 terminals aroused concern recently when two units at *Newsday*, a newspaper in Long Island, N.Y., were found to be emitting high levels of radiation. The apparently erroneous readings were the result of unsophisticated measurement instruments, Charles Setuloff, Teleram's president, claimed.

Of all the terminals examined by BRH, only the two Ontel units and the Teleram 2277 — both of which have plastic rather than metal casings — gave off higher than average radiation emissions. But as Setuloff and the BRH noted, even at those levels, there is no apparent radiation danger to users.

Travel, Rewards, Austere Life Anticipated by Saudi-Bound DPer

By Rita Shoor
CW Staff

ANAHEIM, Calif. — The combination of exotic travel opportunities, generous benefits packages and relatively high salaries offered to programmers and analysts who accept limited-time contracts to work in Saudi Arabia is undeniably impressive.

However, based on an interview with John McClure, a programmer/analyst who will leave the U.S. on June 15 to start a 12-month contract in the Middle East with Aramco Services Co., there are also some negative aspects to be considered.

First on McClure's cautionary list is the fact that single males are hired for most jobs. While there are a few exceptions to this rule for extremely high-level and specialized positions, McClure was informed that "the only American women there are executives' wives." His impression is that this policy is based on the Middle Eastern tradition that women not be allowed to work with men.

The absence of female companionship may be less obvious than in the U.S. because McClure's normal working schedule will run for six eight-hour days every week. He also faced the possibility of spending his off-hours in one of the dormitories constructed for employees who are hired below a certain company-specified grade level.

"I just made it, though," he said and indicated that he will be living by himself in one of the trailers that provide alternate housing to U.S. citizens in Dhash-an, one of Aramco's four major American compounds.

Uncertain Details

An almost total lack of knowledge as to what his responsibilities will be at the new location have added to the normal tension about starting a new job, McClure noted. His title will be project analyst, which he thinks might be involved with the inventory control function, but he is "completely uncertain" regarding the details.

"If a person gets an offer, they won't know before they go what they'll be doing" [when they get to Arabia], McClure said.

What led McClure to accept the offer? "Economic factors were a major consideration," he said. In addition to the base monthly salary that he described as exceptional, the following items are included in his contract:

- An overseas premium amounting to "about $1,000 per month."
- An unspecified bonus, which is awarded if he stays through the entire contractual term.
- Room and board provided by Aramco.
- A two-week vacation every four months. The company pays for the round-trip air fare to anywhere within a distance less than that between London and Saudi Arabia; 10% of this air fare is also provided for travel expenses.
- All relocation expenses, including storage of personal effects in the U.S.

McClure is also considering extending his contract from one year to 18 months since he has been told that if he stays for the longer period, any income earned will not be subject to U.S. taxes.

Travel Opportunity

The opportunity for extensive travel also influenced McClure's decision. His five years of DP experience have already taken him from a stint with Johns Hopkins University in Maryland across the country to (SRI), Inc., in California.

After an additional few months with Manalytics, Inc., a management consulting firm in San Francisco, McClure decided that he would enjoy some international travel "while I'm young" (he is 27 years old).

When asked to elaborate on his feelings about what is a major, if only temporary, change in his life-style, McClure described himself as both very sore (he had just received five inoculations to protect him from various diseases) and "pretty scared."

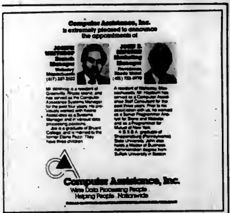
Academic Background

He conceded that his academic background may have made the salary offered by Aramco even more attractive than it would have seemed to a person with more business-related DP experience. "Salaries are always depressed in academia," he observed.

But it was this same DP background with an emphasis on computer simulation modeling bolstered by an undergraduate degree in economics that enabled him to develop the skills Aramco was seeking. During his two years in operations research at Johns Hopkins, he began programming economic models in Fortran and finished by developing a data base manager.

His work with SRI concentrated on a government contract for a guaranteed income program called the Seattle/Denver Income Maintenance Experiment. McClure noted that this program, which provided monthly payments to households in various experimental groups where the total income fell below a government-defined poverty-level figure, is in the process of being discontinued.

However, that experience enabled him to further develop his knowledge of various economic modeling techniques, and it is his impression that these made him more attractive to Aramco, he said.



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U.S. vs. IBM Settlement Talks Change Tenor

By Connie Winkler
CW Staff

NEW YORK — The reported change in tenor of settlement talks between the Justice department and IBM does not rally watchers of the epic case. In a break in the pattern of the settlement discussions, IBM's head trial lawyer Thomas D. Barr from Cravath, Swaine & Moore recently presented IBM's position to representatives of the Department of Justice's Antitrust Division.

A Justice Department spokesman in Washington, D.C., said another session involving Barr is planned within the week. Mark Sheehan, in the public affairs office, said the May 30 meeting was a continuation of the settlement talks begun in November 1979.

He would not specify whether the talks have moved from procedural to substantive matters, only calling this latest session "preliminary."

IBM is believed to be offering a three-way divestiture to settle the case, which is now in its 11th year. That divestiture would regroup IBM into three companies around mainframe computers, small business computers and office products.

IBM watchers, however, are not excited about such a settlement — even if it were eventually to come about.

Analysis

A three-way split may be acceptable to IBM — which has already reorganized itself that way — and to the government, but it would not change the market pattern, A.W.G. "Jack" Biddle said. Each company would still be the dominant firm in its market, according to Biddle, who is president of the Computer & Communications Industry Association and a regular follower of the case.

Biddle also objects that IBM would still be able to set de facto manufacturing standards and not share those standards with others — a familiar beef of the industry group.

Consent Decree

Even if IBM and the Justice Department work out some initial agreement, Biddle doubts it will ever result in a final consent decree. What's called the Tunney bill, passed in 1973, provides rigorous review of any consent decree by the trial judge, comment from the public and an industry impact statement from the Justice Department, Biddle said.

In this case, trial judge David N. Edelstein up until now has dealt harshly with IBM. Edelstein was also the judge who administered the 1956 IBM consent decree.

"Not much is going to change IBM's dominant position," Biddle lamented. "And IBM is certainly not going to do it."

Political Settlement

William Baynham, who publishes an independent Wall Street investors newsletter, suggested settlement talks at this time are politically motivated. A settlement announcement would boost bellwether IBM stock and thus the entire stock market in time for the November election, Baynham said.

Baynham first suggested a political settlement of the case in his September 1979 newsletter, pointing to the market condition and President Carter's close connections to IBM. Two of Carter's present Cabinet officers are former IBM directors — the most obvious connection.

Litigation analyst Calvert Crary remains unconvinced IBM would settle the case which he acknowledges has become a "nuisance" to IBM. However, nuisance is not enough reason to split up a company which is so obviously in the national interest, said Crary, who has recently moved to the firm of Bear, Stearns & Co. here.

Competitive Edge

The computer industry is one of the few remaining where the U.S. still has the competitive edge, and even there it's nip and tuck, Crary said. He believes the government will not do anything to upset this. "If Carter wanted to do something smart, he would drop the case."

"I feel that IBM has an especially strong case on the merits and this has been borne out by the other IBM cases," the lawyer-analyst said referring to the other IBM antitrust cases.

Crary agrees the Justice Department would have a hard time getting a consent decree around Judge Edelstein. "Edelstein is an extremist. He isn't going to go along with any consent decree that isn't outrageous from IBM's point of view," Crary said.

The Justice Department may now be entertaining settlement discussions because of the flack it has received from Congress over the cost and handling of the case — what Crary calls "government at its worst."

"Let's face it," Crary said. "Settlement talks began because they were made by the Court of Appeals. They were upbeat because nobody wanted to be accused of a breakdown — and now it would be a big raspberry for either side to walk out."

Two Witnesses Reluctant To Testify in Rebuttal Case

By Connie Winkler
CW Staff

NEW YORK — The Department of Justice has yet another case on its hands, the case of the reluctant witnesses. Two potential witnesses have declined to testify for the government in the rebuttal part of the U.S. vs. IBM antitrust trial.

Both Gene Amdahl, founder and chairman emeritus of Amdahl Corp., and Patrick J. McGovern, chairman of the board of International Data Group (IDG), have declined to take the stand in the rebuttal case, which is expected to begin later this year.

IDG includes International Data Corp. (IDC), a market research firm which compiles computer industry statistics. McGovern has testified in other antitrust actions against IBM, most recently Transamerica Computer Corp. vs. IBM.

McGovern said he was not interested in testifying because it would take time away from other business activities. Witnesses for both sides have been on the stand for weeks and the U.S. vs. IBM trial is entering its sixth year.

He acknowledged, however, it would be a different situation if he is subpoenaed to testify in the case. The Justice Department is also talking with other IDC representatives about taking the stand.

McGovern is still expected to testify in the Greyhound Computer Co. vs. IBM retrial, set for February 1981 in Phoenix.

Robert J. Staal, head of the government's trial team, said he would rather not comment on the rebuttal case or on Amdahl's and McGovern's positions against testifying.

Amdahl designed computers for IBM before leaving to start his own mainframe company. He was not available for comment.

The Justice Department is also expected to call a witness from its direct case, Cornell University economist Dr. Alan K. McAdams, who has actively directed the government's case. McAdams was on the stand 78 days.

The Justice Department may also call on other economists to testify in the case.

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The reference also addresses how planners can interface with a centralized municipal computer or manage and staff a dedicated computer operation. Techniques for evaluating and selecting hardware and software technologies for planning functions are also offered.

The volume, called *Computer in Local Government: Urban and Regional Planning,* is the latest addition to Auerbach's new "Computers in Local Government Series" of services on using and managing DP resources at the city government level.

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Automated Office Seen Demanding Competence

By Bruce Hoard
CW Staff

GUTTENBERG, N.J. — Although office workers lacking competence and commitment may lose their jobs to office automation, the large majority of today's office workers can thrive in the automated office, according to James H. Carlisle, president of Office of the Future, Inc.

Carlisle cited a "significant" decrease in the literacy and educational levels of both clerical and lower level white-collar workers as a trend that must be reversed.

"Managers are finding they just have to let people go if they can't do the job," the president said. "I think you're going to find a lot of unemployable secretaries."

Part of the problem stems from the fact that secretarial expectations have remained static during the past several years while white-collar workers have been expected to increase their responsibilities; he said.

"People with low commitment, low intellect and low learning aptitude will fail as they always have," Carlisle said. "However, I know of very few people who could not learn office systems."

New Skills

Increased office automation means secretaries will have to develop new skills to replace such outdated tasks as stenography and straight high-speed typing, Carlisle said.

Those skills include more than an understanding of word processing, (WP), which will be the "most important but not dominant" feature of the automated office, he explained. A knowledge of electronic mail systems, filing operations and the proper use of paper will also be required.

As office workers become more competent, professional societies representing them will spring up, allowing workers to develop their skills and keep abreast of technology and opportunities, he said.

And there will be plenty of opportunities, he added. "Secretaries can produce higher quality work more quickly and create opportunities for job enlargement."

Those who learn new skills in the automated office can also "leverage," or upgrade, their positions and become eligible for managerial positions.

Judicious management policies can make the difference between productive and disaffected office system workers, Carlisle said.

As a positive example of office management, he mentioned a manufacturing firm and a bank where he claimed there are waiting lists of secretaries wanting to get into the (WP) center. That is because WP jobs there are given high classification and pay well.

The U.S. government is a prime example of an employer who gives WP a low classification, Carlisle said, adding that it goes so far as to reward workers for lack of productivity.

"If secretaries' jobs are to be more enjoyable, there needs to be some kind of catalyst for change," he said. "Bringing in technology is typically a catalyst."

Office systems make managers think about new things, he said. "I have yet to see a single company who has reduced its work force by installing an office system."

Vendors are the villians, and IBM the most flagrant among them, when it comes to the move to eliminate jobs entirely, he said.

Carlisle admitted that automated office workers could be subject to harassment by the enforcement of rigid guidelines in such areas as output speed and error rate checks, but he added they can also be harassed for spending too much time at the water cooler. The point is, it all depends on how management runs the show, he said.

He denied the charge that the main thrust of office automation is to bring office workers under the absolute control of management.

The only people in a position to exercise undue control over workers are WP center directors or directors of office support, Carlisle said.

However, such instances of abuse are rare and usually happen when the person in power is out of touch with the purpose of his organization, he added.

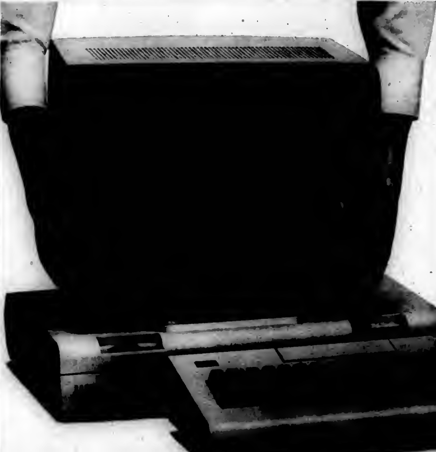
The chance of such abuses happening is also reduced by the tendency of WP operations to be decentralized and thus less likely to fall under the purview of any single supervisor, Carlisle said.

Meet to Cover Office Trends

SILVER SPRING, Md. — The Education Foundation of the Data Processing Management Association (DPMA) will hold a National Symposium on Office Automation of Sept. 15-17 in Chicago.

The symposium will consist of a one-day series of in-depth workshops in major areas of current interest in office automation, followed by a two-day general conference dealing with trends and issues of importance to both DP and administrative services managers, according to a spokesman.

The symposium costs $445 for members and $495 for nonmembers, or lower fees for just the conference or workshop. Further information can be obtained from DPMA Education Foundation Office Automation Symposium, 12611 Davan Drive, Silver Spring, Md. 20904.



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Small Systems Development Reviewed

Applications Productivity Seen Keynote of '80s

By Rita Shoor
CW Staff

ANAHEIM, Calif. – The '80s should be a decade of software and applications productivity, according to Benn Konsynski, from the management information systems department of the University of Arizona.

Nevertheless, users still have difficulty with basics – often "system implementation takes place before design is complete," leading to misunderstanding between the user and DP departments, he said at a conference here recently.

Some solutions posed by Konsynski were more general-purpose software, an increase in program libraries, reducing the effort to produce code through software generators and raising source-language levels.

Small Systems

There are often problems associated with economically developing any small system. "This doesn't mean small machines, necessarily," another speaker, Davide Raber from Megawest Systems, Inc., said. "A small system can be developed on any size of hardware."

A small system was defined as a simple update-inquiry task with limited interface potential – at least from the short-term viewpoint. It should have only one file or, possibly, one master file and several detail files, and there should be no real-time interfaces to other systems.

Raber characterized the potential users of these small applications systems as "scared of us [DPers]." It is the responsibility of the DP technician to "change hats" for this user community and make it more comfortable by providing systems in as little as four hours.

The critical requirements for a small system are rapid development, flexible design and that it be "friendly" to unsophisticated users, with the capability of allowing users to finish projects for themselves.

Raber specified several features as useful to the development of successful systems:

- Dynamic arrays (providing for variable-length records, fields and occurrences with no fixed columns).
- Data dictionary (used to map user-assigned names to physical data elements).
- Report program generator (which must be user-oriented).
- Direct file access.
- Virtual memory management system.
- Powerful procedure language.

The most critical of these elements to a small system would be the data dictionary, according to Raber. "In fact, once you have a sufficiently clever data dictionary developed, that's the beginning and end of the small system design."

Case Study

Mohan R. Tanniru, of the University of Wisconsin, looked at the subject of developing systems applications from a different viewpoint and illustrated it with a case study on "A Structured Information System Design for a Newspaper Organization." The system design was the result of work by students at the University of Wisconsin, Tanniru said, and was done at no cost to the publishing organization.

The primary goals and objectives of most organizations are expressed in financial terms, Tanniru said. However, operational variables are expressed in terms of transaction flows within the organizational structure. The primary objective of the study was to determine how transaction flows would affect the financial variables defined by the users at the newspaper.

The chief management objective at the beginning of the study was an increase in the organization's inadequate cash flow. It was interesting to note that the newspaper went out of business because of cash flow problems that were mainly traceable to "an advertising policy which was too lenient in waiting for payment from advertisers."

Sessions Target Disaster Plans

FORT WORTH, Texas – Data Processing Security, Inc., an international computer security consulting firm, will conduct a number of seminars this year and the beginning of next year, aimed at chief financial officers and management executives.

Held in various parts of the country, the seminars will focus on the viability and need for backup computer facilities and recovery operation centers in a business and government DP setting.

The programs are scheduled for St. Louis, Mo., on July 8; Detroit on July 22; Chicago on Aug. 5; Philadelphia on Oct. 15; Boston on Oct. 21; and New York on Oct. 28. In 1981, the session will be held in Los Angeles on Jan. 13, in San Francisco on Jan. 20 and in Seattle on Jan. 27.

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Panel Reports Decline in Privacy Legislation

By Ann Dooley
CW Staff

ANAHEIM, Calif. — Even though the public's concern for privacy has increased, the amount of protective legislation being passed has decreased, according to a panel of experts at a conference here recently.

Nevertheless, the quality of the bills being introduced in state legislatures has improved, Oliver Smoot, vice-president of Computer and Business Equipment Manufacturers Association (Cbema), contended.

Smoot noted that the states act as "testing laboratories" for changes and new ideas in society and that currently state legislatures are dominated by money relationship bills such as fair credit practices, medical records and employee records.

But, Smoot warned, each state has different ideas about privacy. Even though the bills may be passed into law, that does not guarantee they will be successfully implemented or that funds will be appropriated to enforce the laws.

The panel members agreed that, to be effective, laws must be practical and enforceable.

Under Consideration

According to Smoot, Cbema is currently tracking 96 state, county and local bills dealing with collection and storage of information. Examining current activity, Smoot noted that five states are considering Freedom of Information bills and a like number are considering employee record bills.

In 1977, 15 bills in this area were introduced at the state level and four passed; in 1978, 15 bills were introduced and only one passed; while last year, 21 bills were presented and two passed, he said.

Smoot also noted that seven states have medical record privacy protection and 10 states with 12 bills have laws dealing with fair credit reporting.

No bill has been passed on the state level regarding electronic funds transfer (EFT), although six states have introduced bills on computer crime and 11 states have passed protective legislations. Five states are currently reviewing criminal justice bills, according to Smoot.

Industry Regulation

Dahl Gerberick, manager of requirements planning at Xerox Computer Services, contended that private industry should regulate itself or the federal government may create laws that spawn more problems than would otherwise have occurred.

And when implementing privacy actions, industry should remember to minimize obtrusiveness, maximize fairness in recordkeeping and create legitimate and enforceable expectations about those records, Gerberick said.

Gerberick, a former chairman of the National Ombudsmen Committee for the Association for Computing Machinery, stated that the three critical areas in privacy encompass employer/employee recordkeeping, fair credit and EFT and how the public views these issues.

Public Views

According to recent surveys, the public has indicated its does not want infiltration of private information even in it means cost savings, Gerberick said. Citing a variety of recent polls, Gerberick noted that 64% to 36% of the public is concerned about invasion of its privacy.

As much as 72% of the public feels most private and governmental agencies collect more information than they need, and 50% fear how it will be used. And 52% to 27% of the public do not believe that there are enough adequate safeguards protecting privacy.

Victor Paradis, coordinator for California's Criminal Records Security Unit, gave attendees a practical look at maintaining a sensitive file. Paradis noted that agencies may have a difficult time with privacy practices because the laws are often vague and frequently change.

Paradis' agency maintains a record of anyone arrested, and Paradis contends that automated files are easier to protect than manual files because their access can be controlled.

Automated files are also easier to purge, according to Paradis, who stated that "bit paper file purging is a nightmare." Incorrect information can also be spotted more easily through error signals, whereas a manually operated system can easily bypass such mistakes, he added.

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Monthly Newsletter Focuses On 'People-Ware' Skills

NEWINGTON, Conn. — "Getting Ahead in DP" is a monthly newsletter offering information on the development of "people-ware" skills that technically oriented DPers frequently lack, according to publisher Lane Richards of The Meld Group.

"The increasing size of DP departments has made interpersonal and management skills as important as technical proficiency in succeeding in the DP environment," he said.

The publication, started in February, features a series of regular columns that touch on various aspects of survival and success in the DP environment.

The "Corporate Maze" section was designed to help the reader understand and navigate through channels of the corporate power structure. Topics include promotions and the meaning of matrix organizations.

Intricate interpersonal situations are discussed in "What Would You Do?" The feature presents the reader with typical situations and then offers considerations on developing the proper response.

Don Berardo, a career therapist and management counselor, answers specific questions about workplace problems in "Dear Don." And "DP Manager" offers guidance on managerial approaches and techniques to help managers improve their own skills while developing staff members' potential for increased productivity.

Each issue varies in length, but is usually six or eight pages. The subscription cost is $39 yearly. The Meld Group can be reached through P.O. Box 11573, Newington, Conn. 06111.

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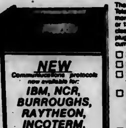

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First: Define All Goals

Software Implementation Methods Addressed

By Marguerite Zientara
CW Staff

ANAHEIM, Calif. — A clear and quantitative definition of all the goals expected to be met by a software system is the first and most important step in software development projects.

That was the consensus of a panel of seven speakers at a national conference here.

Based on the premise that project management tools and techniques will aid in the success of delivering a software product on time and within cost allowances, the session dealt with implementation methodology, problems in implementing systems, implementing embedded systems and current educational efforts in the area.

In establishing a Systematic Software Development and Maintenance (SSDM) methodology at Boeing Computer Services in Seattle, three main objectives were identified, according to Joan Bateman, senior software engineer in the Energy Technology Application Division:

- Establish a project management discipline using a systematic approach.
- Use computers to help develop software to lessen the technical burden for engineering personnel.
- Include improved productivity techniques resulting in improved human resources.

Master Plan

The strategy for success in the project involved initially establishing a Master Plan indicating who would do what and within what time period, Bateman said. Secondly, it was necessary to get commitment and support from management at high levels and at operating levels.

The project then involved the training of 3,000 to 4,000 people "from a variety of backgrounds" in software management and a knowledge of SSDM, followed by the distribution of reference materials.

"The real reason for the success of the project was the establishment of a consultant team — with one member 'belonging' to each operating division — that provided feedback from users and clients and resulted in a smoother and more effective operation," Bateman noted.

While the plan took eight years to develop, "we are always incorporating new ideas into SSDM and will continue to do so over the next decade to produce cost-effective tools," she concluded.

Need for Preplanning

One of the main problems in implementing a project management methodology is "the reinventing of the wheel that I see everywhere," observed Brian Dickinson, senior staff consultant for Yourdon, Inc. in San Francisco.

Citing a case study on which he worked involving a "major California bank," Dickinson reiterated the need for extensive preplanning and described five factors that must be considered in any such project.

Concerning political/psychological considerations, Dickinson suggested some ways to overcome people's "natural resistance to change." One way is to allow users to customize the software for their own uses so that "it then becomes their own."

Another method is to form a review group comprised of managers from the areas destined to use the discipline and, third, implement a pilot project to serve as proof of the discipline.

In the area of packaging, Dickinson suggested that documentation, manuals and guides should not be so voluminous as to overwhelm users. Furthermore, users should be told explicitly how to access the content, where they may find needed examples and should be given tutorials if necessary.

Training can be accomplished through a workshop course with consulting assistance, a course with on-the-job experience, a self-study audio visual effort, through books or documentation ("unsatisfactory due to the many interpretations possible") or exposure to others. As for strategies of installation/training, Dickinson noted there can be a pilot project for evaluation and experience, top-down or bottom-up training or fixed courses given whenever someone is available to take one.

Hard-Nosed Approach

A hard-nosed approach to "maliciously recalcitrant users" was posed by Anthony Lee, DP manager in the Department of Finance for the State of California. "It may seem brutal, but in some cases you just have to transfer someone to another function or get rid of him altogether.

"For example, if the head of a clerical department with 200 workers finds his staff will be reduced by half, he may see that as a loss of power and will proceed to miss deadlines and be uncooperative in the project," Lee said.

"Many times, by the time you're ready to automate a function, it's really suffering," Lee observed. "A leader may see the planning necessary for automation as 'doing DP's work'.

"Sometimes these people just have to go in order to move ahead with the project," he said.

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AWC Chief Urges Women to Know Hardware

By Connie Winkler
CW Staff

NEW YORK — Brenda Pena carries a screwdriver in her purse.

"It's handy. You never know when you're going to need it," said the communications and DP equipment planner for Consolidated Edison Co. of New York, Inc.

Thanks to the screwdriver, for example, Pena recently disconnected, moved and reconnected a terminal in her office.

Pena thinks more women should begin carrying screwdrivers and get to know communications and DP hardware. "My thing is to get women into hardware," said the president of the New York chapter of the Association of Women in Computing (AWC), referring to communications and technician jobs.

AWC President Brenda Pena

CW Photo by C. Winkler

Although some communications observers see no fewer women in commonications than in other DP areas, the need to bring women into that area has not been missed by another group, Women in Data-Processing, Inc., which is currently sponsoring four telecommunications workshops.

There are real job opportunities in communications, but the shortage of women in this area was underlined by the difficulty of getting female instructors for the telecommunications seminars, said Denise L. Hassman, president of Women in Data-Processing. She ended up with one female and one male instructor.

Job Ads

The dilemma of the communications job situation for women is illustrated by two recent employment ads in the *New York Times*. One employer, a "fast-growing terminal supplier who can offer . . . a bright future" was looking for an electronics technician.

The job required "one year technical school training in digital and analog circuitry with two to three years experience. Able to troubleshoot and repair to the component level on CRTs; impact, thermal and dot matrix printers; and cassette tape drives."

Few women would think of applying for that job because they might not have the technical schooling, explained Pena, who has several education degrees and got into communications by writing training manuals at a time when not many DPers knew what a modem was.

On the opposite page of the *Times* was a larger, more attractive ad for telecommunications line management professionals. The job requirments:

"Experienced and organized individuals to be responsible for installation and/or service repair groups. Will work as part of a highly professional and closely integrated installation, implementation and maintenance team. Need 5 to 10 years installation or field service.

"Supervisory experience with PBX, electronic or digital switches or other related telecommunications equipenent. You must be a well-organized decision maker, capable of working under pressure."

Many women have the organizational, managerial and personnel skills and would be attracted to this ad, Pena said. The catch is that the second job requires the experience of the first — which most women would not have.

"At the high school level," Pena explained, "women aren't encouraged to go to technical school, but are steered into secretarial and clerk jobs."

Another reason few women enter communications is that there are few women electrical engineers, observed Jean B. Bubley, a communications consultant and one of the instructors for the Women in Data-Processing course. "The people I know in communications are more from engineering — they started in engineering and got into communications software."

Bubley began her career as an applications programmer for a terminal vendor in 1975, has moved through a series of jobs designing and installing large networks and is now a consultant with Systems Strategies, Inc. in New York.

"If you know you're interested in communications, look specifically for companies doing this type of work — and get in on it in the beginning," Bubley urged.

Besides the fact that there are not many other women around, Bubley said the only problems she felt as a woman in communications were the same as for any women in DP.

Equal Advantage

William J. Leitman, also an instructor in the telecommunications for women course, rejects the idea that there is a shortage of women in communications. "I see the computer industry as one in general where women have equal competitive advantage. Generally there's more acceptance of women."

Neither does Eleanor M. Bird, manager of the technical systems at Royal Insurance Companies, find any shortage of women in communications areas. One of the four trainees in her systems communications area is a woman.

"Just like men, women are not planning their careers," Bird said about the communications area. "They're just blowing with the wind and not taking advantages of the possibilities in the company."

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Personal Computers Seen Misrepresented by Vendors

By Tim Scannell
CW Staff

ANAHEIM, Calif. — Many people have been victims of "used car salesman" selling techniques that boast the benefits of small computers without delving into the difficulties of user responsibilities, according to Dr. Gerald Engel, a professor at Christopher Newport College, in Newport News, Va.

Noting the effectiveness of the micro selling campaign, Engel stated that nearly every college in the U.S. oses some sort of a microcomputer in its teaching programs.

And studies predict that by 1985 nine out of 10 households will have at least one personal computer. However, it is interesting to see that none of these projections use the year 1984 as a target date, Engels stated.

Early Education

Acknowledging the fact that personal computers do have a place in education, the self-proclaimed devil's advocate hinted that early DP education is taken a little too lightly.

For instance, small computer vendors and promoters are forever saying that programming a computer is as simple as breathing, when they should be telling students that good programming is difficult and even complicated, he said.

If a more accurate attitude in DP education is not taken, then the benefits of personal computing will be much slower in coming and more vulnerable to a bad reputation.

Job Security

Answering a question from the audience, Engel observed that early DP training will not affect the job security of present DPers by creating hordes of more qualified people.

Rather, increased DP activity at the grade and high school levels will probably promote more jobs in the future, he said, noting that not all kids who take high school chemistry become chemical engineers.

Dr. John Walstrom, a teacher at Western Illinois University, warned that, because of a shortage of competent DP instructors at the high school level, students are actually becoming more computer literate than their teachers. As a result, teachers not only lose directional control, but students are bored to death.

Focusing on the small business user, Walstrom also advised users not to get wrapped up in the technology and rush to buy more equipment than necessary.

Before purchasing a system, the future user should identify personal requirements, develop specifications to meet those requirements and evaluate alternate means of satisfying those needs.

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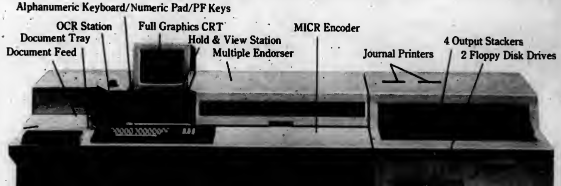

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Women in DP Advised on Career Planning

By Marguerite Zientara
CW Staff

BOSTON – To successfully plan and manage your career in DP, you must know the market, define your goals, develop plans to reach those goals and continually monitor and adjust your career plan.

That was the advice of Robert L. Brown, president of Conec Co., Inc., a DP-oriented employment service organization based in Framingham, Mass., who spoke at the May meeting of the Greater Boston Chapter of the Association for Women in Computing.

Addressing about 50 area women ranging from students in computer science to management-level DPers, Brown cited a recent *Datamation* survey that indicated a 28% annual turnover rate in DP personnel. "That means the average statistical time a DPer spends at one job is 3.69 years."

As further evidence of the trend toward shorter term jobs, Brown shared the results of a Conec survey of 1,200 people conducted last year, which indicated that 12% of those surveyed were actively seeking a new position, 17% were inactively seeking a new position, 51% would consider a new position if offered them and only 20% would not consider a new position.

Suggested Reading

For the 29% of workers who are actively or inactively seeking new positions and those who want to be prepared in case a "job crisis" arises, Brown suggested they read the *Wall St. Journal*, *Computerworld* and the local Sunday paper classified ads regularly.

"If you read the first five pages of the *Wall St. Journal* every day, you'll know the major players in the business game," Brown noted. "*Computerworld* offers the heaviest concentration of employment advertising in the DP field, so you can know who's hiring, what positions are open and what those positions entail.

"The Sunday classifieds give you the local picture of DP hiring so you can pull the information together," he added.

Besides being aware of the current job market, DPers should research and keep up with what's happening technically in computers and communication. "The 1980s will be a decade of change," he predicted. "We cannot even imagine what will be happening in DP in 1989."

Company Life Cycle

"One of the most critical things you need to know is where a company is in its life-cycle," Brown said, recalling the case of RCA Corp., which was still hiring people one week before it went out of business.

"Sometimes employers lie, either because they are forced to or because they simply don't know the company is going down the tubes," he observed. "By reading business periodicals, you can look for such things as increasing or decreasing profits, new employee benefits or other news that might indicate what is happening overall to a firm."

Whether a job seeker gets to an employer's door through a recruitment or career counseling service, or by his or her own efforts, "remember that interviewing is a two-way street," Brown advised.

"In an interview, you should talk to a company about what they can offer you as well as what you can offer them," he said, noting that the interview is the first step in "building a working relationship."

The potential employee should ask the following important questions:

- Why is the position open? (Is the firm expanding, did someone move up within the company, or did the last three people quit?)
- How long has the position been open?
- If you would be a replacement, what happened to the last person in the job?
- How would you be evaluated – what would be used to measure your performance?

A job applicant should also ask to speak to those with whom he or she would be working, Brown said. "Ask the manager what his objectives are for himself and for the department and see whether they corespond to your own."

Five Quantifiers

When looking for a job and a company appropriate for you, there are five quantifiers to keep in mind, especially in the early stages of a career, according to Brown.

The first job measurement is whether you will have the opportunity to learn on the job. "This industry is changing by the nanosecond and there is nothing more obsolete than people who are not current with the industry," Brown noted.

For example, in the case of someone who moves from company to company putting in the same accounts payable system, always at a 20% pay raise, the accounts payable system will eventually atrophy and "technology will be the saw that cuts it off," Brown said.

Secondly, what opportunity would you have "to get out on the floor and do things?" he asked. Furthermore, consider the credentials of the people at the company you're considering joining.

"It's better to be a programmer trainee at a large organization like IBM than at the Nuts and Bolts Corp. in the middle of nowhere," Brown observed. Another point to consider is whether your work will be visible to the firm's top management or whether you'll be "stuck in the basement" with no exposure beyond your immediate coworkers, Brown said.

Finally, "there's nothing unethical about using contacts," Brown noted. "What we're establishing in meetings like this is a 'new girl network' as a counterpart to the 'old boy network.'

"It's astounding how fast information travels in such a network," he said. "You can find out about good companies, bad companies, good individuals and bad individuals; it's absolutely essential to people just starting out in the industry."

One of the pitfalls in career planning is the tendency to follow society's idea of success, Brown maintained. "Some people feel that unless they are managers or unless they get promoted, they are failures, but that's just not true.

"If you don't want to be a manager, don't do it – it's one of the fastest ways to sidetrack a career," he added.

Management Specialists Named to Plan Info '80

NEW YORK – Ten information management specialists have been named to the program committee of the Information Management Exposition & Conference: Info '80 to help plan conference sessions.

Dr. I. Edward Block, managing director of the Society for Industrial and Applied Mathematics (Siam), Philadelphia, will continue this year as program director and chairman of the program committee.

The other members are Dr. George Clowes, manager, marketing information systems/ISD, The Quaker Oats Co., Chicago; Robert M. Dickinson, manager office systems, technology division, Exxon Corp., New York; Robert J. Franz, partner, administrative services division, Arthur Andersen & Co., New York; Norman L. Heilweil, administrator, education and training, Grumman Aerospace Corp., Bethpage, N.Y.; Arnold E. Keller, associate publisher and editorial director, "Infosystems," Wheaton, Ill.

Also named were Amy D. Wohl, president, Advanced Office Concepts Corp., Bala Cynwyd, Pa.; John W. Konvalinka, partner, administrative services division, Arthur Andersen & Co., Philadelphia; William H. Stieger Jr., evaluation analyst, Standard Oil Co., Cleveland; William R. Synott, senior vice-president, First National Bank of Boston, Boston; Harold Uhrbach, president, DBD Systems, Inc., Rockville, Center, N.Y.

Info '80, which takes place at the New York Coliseum on Oct. 6-9, is expected to be this year's largest information exhibit in the area and already exceeds last year's exhibit space, according to Clapp & Poliak, Inc., New York, the management firm which produces the conference.

More information is available from Clapp & Poliak, Inc., 245 Park Ave., New York, N.Y. 10017.

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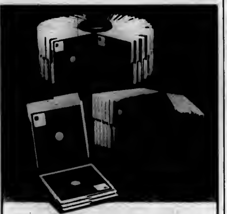

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PERKIN-ELMER

From Artist's Whim to Videotape

System Uses Animation to Help Teach Metrics

Special to CW

OLD WESTBURY, N.Y. — Artists at the New York Institute of Technology's (NYIT) Computer Graphics Laboratory (CGL) here are using a computer-aided animation system to teach youngsters here to count in liters and meters.

Designed by the CGL staff, the metrics teaching system generates images according to the artist's whims to produce animation of broadcast quality. The staff recently used the Digital Equipment Corp.-based system to create a 28-minute film called "Measure for Measure," which will hopefully inject some needed life into the often dry subject of metric education.

The computer-aided system is capable of producing high-quality animated works with many more layers of color and movement than conventional animation techniques. The system can also produce these images much faster than previous methods, according to Bruce Laskin, director of the Digital Research Laboratory at NYIT. Most importantly, however, the system reduces the drudgery involved in conventional animation by performing many of the repetitive tasks usually faced by animators.

The artist utilizes the animation system through a DEC PDP-11/34 workstation, which runs under Bell Laboratories, Inc.'s Unix operating system.

'Superpaint' Software

However, the soul of the system is NYIT's Superpaint software that lets the animator draw a picture using an electronic pen and digitizing tablet.

The picture the artist draws appears on a color monitor in front of him. A graphics display processor presents a menu of animation functions the artist can choose while drawing the picture. The functions are activated by the artist, who uses the electronic pen and tablet to direct a cursor appearing on the display screen to the appropriate menu item on the screen.

The PDP-11/34 workstation also includes a CRT terminal and keyboard that the artist uses when he must interact with the computer. An 88M-byte DEC RP04 disk drive completes the workstation configuration.

Using the Superpaint software, and with the system at its maximum configuration, the artist can display more than 4,000 different colors at one time out of a possible 96 billion gradations, Laskin claimed.

Repetitive Drawing

The software also allows the artist to draw backgrounds while another package, called Tween, permits drawing characters in action. With Tween the artist can produce the line drawings that become the featured characters in the film or videotape being produced. Tween fills in the motion of the character for the artist, eliminating a repetitive drawing job in conventional animation.

For example, if an artist wants to draw a picture of a man raising his arm, he first draws a picture of a man with his arm lowered. He then draws the ending picture of the man with his arm raised. The software fills in all the motion in between.

Of course, the software is not perfect and will tend to have the arm raise at one set rate of speed, Laskin noted. To account for inertia and make the picture appear more normal, the artist must speed up or slow down the action.

Frame Assembly

After all the necessary frames have been drawn — all the backgrounds painted and all the characters made — the picture frame must be assembled. This is the most difficult chore handled by the computer-aided graphics system. It requires a computer that can cope with huge amounts of data in a very short time.

Until recently, the lab had been using a DEC PDP-11/70 system for this part of the application. However, it now uses a much faster DEC VAX-11/780. The VAX system also operates under the Unix operating system.

The VAX system includes 500K bytes of memory, two RP06 disk drives, one tape drive and a DZ-11 terminal multiplexer. Data is transmitted to it through a PDP-11/35 acting as a communications processor.

"We are using the VAX in a nontraditional type of role," Laskin explained. "We wanted something that was faster than the PDP-11/70. Assembling the film is a time-consuming process because of the amount of data involved. The success or failure of this project depends in a large part on how fast the films can be made."

With the PDP-11/70, each frame took about 45 seconds of CPU time. But the VAX can assemble a frame in 20 to 25 seconds, the director noted. The entire computer graphics system has proven to be 20% to 50% faster than conventional animators while also allowing more flexibility than conventional animation.

The system even simulates "camera movements," panning where the film's creator wants to pan.

The VAX also controls the final steps to transform the artist's picture into either videotape or film.

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CPU Gives Lesson in Subtraction

By Bruce Hoard
CW Staff

LOWELL, Mass. — The Lowell Regional Vocational Technical School here is sitting discontentedly on a six-year-old computer system that costs about $78,000 in maintenance and leasing costs annually while providing only perfunctory service.

The school may not have to sit much longer because the Greater Lowell Regional Vocational Technical School Committee has voted to sell the Xerox Corp. 560 system, which originally cost $350,000 in 1974. The committee hopes to receive $125,000 for it.

The computer was originally purchased from Honeywell, Inc., which took over Xerox accounts after that company abandoned the mainframe market.

Plan Foiled

The school's intent was to use the system to satisfy the DP needs of the five communities belonging to the regional vocational school. The plan was foiled when each of the communities found it more convenient to handle its own needs rather than work with a computer nobody completely understood.

Simple tasks such as class scheduling for the school's 2,000 students had to be done by hand. Several DP directors came and left, unable to put the system to work.

The latest of those directors, Michael Pattavina, had to contract out support services — scheduling and report card and payroll processing — for a fee of $12,000 when he assumed his duties last fall, he said.

When asked what kind of instructions and documentation were included with the 560 at the time of purchase, he said, "I don't know. I wasn't here when that happened." Nobody knows, he said.

It's a very expensive system to be in the dark about. The 96K-byte mainframe is supported by four leased 49M-byte disk drives and a Xerox printer, Pattavina said, adding that only about 10% of the secondary storage is being used.

The leased equipment alone costs $53,000, while maintenance costs for the entire system add another $25,000 to the bill, bringing it to an annual total of $78,000, he said.

Negotiations Under Way

The school is undergoing "negotiations" with Honeywell about its contract, and Pattavina replied "That's personal" when asked when the vendor had last been sent a check for services rendered. The school is considering taking Honeywell to task, he added, but declined to elaborate.

The school arrived at a potential price tag of $125,000 after consulting a dealer in used computers in Minneapolis, Pattavina explained.

If and when the 560 is sold, the school may consider several other systems, including a Wang Laboratories, Inc. VA system, he said.

For System Programming

Mature Standards Usually Lacking

rnaro d Time
By Larry E

Q Over 600 people work in the Division of MIS, of which about 20, including myself, are systems programmers. Business systems, control, operations and data entry have well-established standards that were set primarily by our standards and procedures group. To my knowledge we have no established standards by which to guide activities of system programming efforts.

Is this standard in most computer centers, or are we unique?

A Your present situation is more the rule than the exception. To answer your question, you are not unique in this respect. It is the rare computer center that has achieved a mature set of standards and procedures for system programming.

There are several underlying reasons for this lag in systems programming standards implementation. Just 10 years ago computer system vendors supplied and maintained virtually all of the systems software, and only the most daring of computer centers would wander into the sacred halls of "system software."

Since that time, the advent of sophisticated operating systems, data communications and computer networks, data base management systems, performance measurement software and numerous software aids for increasing throughput has altered the computer center's role in systems software. Your group is probably experiencing growing pains similar to those that your business systems group had a few years back.

Another problem in many computer centers is that more often than not all of the members of the "standards and procedures" groups were raised in the applications side of the house and are reluctant and often not capable of addressing the area of systems software. The obvious solution is to appoint a systems software specialist to the group.

If you have recognized the need for standards in systems software, then I bet that your colleagues, your boss and probably his boss are aware of the need. If not, the first step is to discuss the matter with your immediate supervisor.

Q I was recently promoted to project leader in a medium-size DP shop and was assigned the task of upgrading our personnel system from batch to on-line. We don't have much in the way of methodologies, but my boss said to start with the feasibility study. I asked him if it was still up in the air as to whether we proceed with the development of the system. He said that the decision was already made to implement, but management needs costs and manpower requirements.

I'm confused. If a feasibility study is not used to determine the feasibility of the system, then what is it?

A I am amazed that hard-dollar estimates and manpower requirements used for long-term resource scheduling are by-products of feasibility studies based on mere ideas or concepts. These estimates are critical to the success of the project and should be based on a solid foundation of information.

The term "feasibility study" as generally applied to computer-based information systems is a misnomer. There are many existing on-line personnel systems, so we know that it is technically and probably economically feasible.

As you implied in your letter, management wants costs and manpower figures. For sure, these figures should be contained in the results of the feasibility study. Unfortunately, the traditional approach to derivation of these figures is suspect. A very common mistake is to develop these figures based on a concept rather than a design.

More often than not, the team that accomplishes the feasibility study grossly underestimates the costs, manpower requirements and time to completion. The reason for this underestimation is apparent: they don't have a handle on the scope of the project.

I have always recommended a "comprehensive feasibility study," which includes some very general system design. The time expended on the design is time well spent, since, with this approach, most proposed systems are ultimately approved anyway. You not only have accurate estimates of resource requirements, but you have a substantial leg up on the design process. Good luck!

Have a question? Send it to Larry Long, Editorial Department, Computerworld, *375 Cochituate Road, Rt. 30, Framingham, Mass. 01701.*

Long is a professor at Lehigh University, a DP consultant and author.

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EDITORIAL

Teaching Software Engineers

The dearth of people able to teach applied computing skills in the nation's colleges and universities has reached crisis proportions.

Hundreds of faculty positions in computer science are unfilled, largely because industry and other sectors outside of academia offer computing-oriented Ph.D.s far better salaries and, in many cases, better research conditions [CW, Nov. 5].

Of course, computer science per se is not usually concerned with solving problems in applied DP. In this respect, the relation between computer science and DP is roughly analogous to that between physics and electrical engineering or between biology and medicine.

But most people who have become DP professionals during the past decade acquired the bulk of their basic training in computing as participants in collegiate computer science programs. Since that situation is likely to continue through the next decade, the present scarcity of computer science professors poses a serious problem for DP managers.

Fortunately, a number of U.S. companies strongly committed to computer technology as users, developers or suppliers are working with the nation's educational institutions to provide appropriate training in various fields of applied DP.

Software engineering may be the most important in terms of relevance to the concerns of DP managers. The IEEE Computer Society recently published a recommended curriculum for a university program in software engineering.

Panelists at a recent National Computer Conference session discussed the nature of such programs and how they differ from traditional academic disciplines [CW, May 26]. Prof. Walter Karplus of the University of California at Los Angeles' (UCLA) computer science department observed that mechanical and electrical engineering require a background in the fundamentals of natural science and mathematics. In contrast, software engineering — which concerns methods for optimizing efficiency in the development of computer programs — generally does not require much background in subjects outside of computing. Aspiring software engineers can usually spend more time with the humanities and arts than can more traditional engineering students.

Some technology-oriented companies have made commendable efforts to deal with the problem of inadequate software training resources in U.S. schools. TRW, Inc., for example, has made UCLA's software engineering program available to employees of the firm's Space and Defense Systems Group.

Software engineering may prove an exciting addition to the curricula of American universities. Its immediate relevance to industry together with its adaptability to a wide range of arts and sciences may significantly benefit schools now underenrolled and underfunded.

DATA PAST

Five Years Ago
June 11, 1975

WASHINGTON, D.C. — AT&T told the Federal Communications Commission (FCC) that it planned to almost double the rates charged for its Dataphone Digital Service (DDS). The AT&T tariff proposal had been expected and complied with an FCC order issued in December 1974. In that order, the commission told Bell it would have to institute a two-tier pricing system for DDS. AT&T then proposed the second group of higher rates in that two-tier scheme.

Eight Years Ago
June 14, 1972

NEW YORK — A continued reduction in member services and a 40% increase in dues was announced by the Association for Computing Machinery (ACM) in an effort "to pull ACM from the brink of bankruptcy."

LETTERS

No Tripartite Plan

The article "IBM Seen Ready to Present Tripartite Plan" [CW, June 2] was wrong in several respects.

IBM neither presented nor intends to present any plan that would break up the company into any number of entities. The so-called "red, white and blue" plan described by the author simply does not exist in the company.

Contrary to the report, IBM never made such a proposal in 1975, or at any other time, and certainly was not involved in "hushing" one up. Moreover, IBM will not make or accept any such proposal today. The reporter, Connie Winkler, had been told previously by IBM that rumors about such a proposal were wrong. Not to include IBM's position was irresponsible to your readers, IBM and its employees, and other interested parties.

Winkler also was wrong in stating that the trial has been adjourned since March. While it is true that no live witnesses have been on the stand recently, the trial has continued with an important phase — the entering of thousands of documents into evidence, which is extremely time-consuming for the parties and the court.

Victor J. Goldberg
Vice-President

IBM
Armonk, N.Y.

Article Rated a 10

No need to obfuscate the measurement of David Steven's article [CW, May 19]. It was a 10!

John Boddie

Newark, Del.

Drucker Inconsistent

The interview with Peter Drucker [CW, May 19] elicited the expected verbal brilliancies and many nuggets of pure gold. I hope, however, that those more competent to do so than I will challenge his strangely biased views on IBM and the government antitrust suit against it.

In summarily stating that "the suit itself was without merit" and that IBM is simply "being accused of the incompetence of the others," Drucker is surely flying in the face of a considerable amount of evidence, much of which has appeared in your columns — including a typical example in the Taylor Report on Page 63 of the same issue!

If "the others" have been incompetent, it can only be in the area of what is euphemistically known as "marketing" — an interpretation made by Peter Drucker in several of his books. No one denies that IBM has made numerous major contributions to the computer art; the government's antitrust suit may have been ineffectively prosecuted. But the suit contends that many of these "marketing" practices were illegal. Your columns, and the experience of many users, suggest that the government had ample grounds for bringing its suit.

It is possible that Drucker's preoccupation with "top management problems" blinds him to the many technical and specific issues involved in objections to IBM's practices. However, there is a strange inconsistency in his appropriate emphasis on the growing importance of mini- and microcomputers, and of office terminals supported by distributed or time-shared systems; in his statement that "those people in Armonk are much brighter than I am"; and in his failure to point out the relative weakness of IBM in these areas due — undoubtedly, Drucker would say — to poor "marketing" of the kind which really matters.

Ian E. Bush

White River Junction, Vt.

(Other letters on Page 29.)

READER COMMENTARY/Robert Moreau

Series/1 Cobol Problems Do Have Solutions

In a recent article, Alan Taylor mentioned a few of the problems with IBM Series/1 Cobol under the Event Driven Executive (EDX) operating system [CW, May 19]. Version 1, Modification Level 2 of EDX Cobol was released April 29. We received our copy May 28 and will be testing it shortly.

We have delayed publication of our progress with the Series/1 because we wanted to include the results of our testing of 1.2. However, as a result of Taylor's column, we have decided to release this article.

The EDX Cobol is in essence the same Cobol that has been out for some time under the Realtime Processing System (RPS). The early manuals were copies of the RPS manuals and conversion from one compiler to the other was to be minimal effort. Both compilers have the Map 370 and other 360/370 features. Based on the RPS performance, early critics predicted that the EDX Cobol would be very slow.

My firm was one of the first software houses involved with full systems development under the new software. Based on our experience over the last 10 months, we are very "bullish" on the Series/1 with this software. However, we have had to pay a very high price to master the techniques necessary to make a complete system work.

The EDX Cobol was released in late July of last year. IBM provided a memorandum explaining how to install the software included on diskettes. To begin with, one needed to IPL with the starter nucleus provided. The starter nucleus did not provide for a system with only IBM 4978 terminals and several other variations in configuration. This made installation a long tedious series of problems, and very little assistance was available.

The IBM Indexed Access Method was not released until Oct. 26. When we tried to install the software, we got terminal compiler errors. By this time, IBM had set up a "hot line" to Boca Raton, Fla. We found out that we could not use the Indexed Access Method or Sort/Merge until we received a new release of EDX.

We have received many "fixes," both over the phone and by way of program temporary fixes (PTF) for the Indexed Access Method, EDX operating system and utilities. We have never received a PTF diskette for our Cobol problems. Our normal method of operation has had to be one of "keep trying until it works."

With this attitude, we have managed to develop techniques for overcoming many of the problems mentioned in Taylor's report.

Some New Problems

Since we have some completed systems and portions of systems now running, we have also uncovered new problems. Our very frustrating and frequent experiences have been as follows: We spend hours with a bug in our application (sometimes days) until we can find no programming errors. We call Boca Raton and find that there is a known problem with the IBM software. We must rewrite our programs or apply a patch over the phone to the IBM software. Much time is lost and a new program may end up with a change in logic.

We could not tolerate these losses in our productivity and wrote a letter to all our customers stating the problem and a possible solution. The letter was forwarded to the Long Island Series/1 Users Group (Lisoug). Lisoug forwarded out letter and one of its own to Common and the appropriate people at IBM. After several weeks, IBM gave us almost everything we asked for — a method of distributing all known problems through the General Systems Division (GSD) and then to us (the user).

If a programmer knew about the following problems, even with no solutions, he could write his program or design his system in a way to circumvent them and save time.

Problem 1: According to Cobol manuals, you may define a key as a group item as follows:

```
01 CUSTOMER-KEY
05 TERRITORY                    PIC XX.
05 TYPE-BUSINESS                PIC XX.
05 ZIP-CODE                     PIC 9(5).
05 CODE                         PIC 9(4).
```

However, keys will not work unless they are an elementary field. The above key may be built in Working Storage, but it must appear in the file definition area as:

```
01 CUSTOMER-KEY              PIC X(13).
```

This is a clear contradiction to the manuals.

Problem 2: As a record gets larger, the Cobol compiler does not reserve more working space to process the larger record. The programmer must write an EDL program to replace one of the Cobol compiler output data sets, compile it (under EDL) and name the

(Continued on Page 26)

HUMAN CONNECTION Jack Stone

Software Packages Enter Conference Big Leagues

I was recently invited to participate in Software Info which, I was told, is the first conference devoted exclusively to the packaged software industry. Planned for Chicago in the fall, it will consist of presentations, discussions and panels devoted to a wide range of subjects related to software packages. The presentations will run concurrently with software vendor exhibits.

I interviewed Robert V. Head, assistant for ADP technology at the U.S. Department of Agriculture, about his thoughts on the current status of the packaged software industry. Head is a well-known proponent of packaged systems and one of the discussion leaders at the conference.

What do you feel accounts for the phenomenal growth of the software industry?

Head: The growing importance of software packages can be characterized by a single word: productivity. I recently heard a presentation by Booz Allen & Hamilton which estimated that the present base of 500,000 programmers and analysts in the U.S. would need to expand to 14 million by the end of this decade if we are to develop enough programs to make use of the enormous hardware capacity that will become available from the manufacturers.

What are the major advantages of software packages?

Head: Software packages — in particular, application packages — provide two significant advantages to the user organization: reliability and low cost. This means that there is not only a dollar saving but there is also some reasonable assurance that the system will go into production on schedule.

If we look at systems development work from a managerial standpoint, we are really contending with a resource allocation problem. If a package can be brought in and applied, the management information services (MIS) director will not only save money but will be able to assign his people to develop projects for which there are no packaged solutions.

And the disadvantages?

Head: I suppose the chief disadvantage is one of package fit. A package may not do all the things that need to get done. This means that the MIS director may have to compromise on some requirements or spend time and money retrofitting the package to make it more suitable.

I must say, though, that many objections to software packages are more imagined than real, like the NIH (Not Invented Here) factor — systems analysts and programmers can be very adept at picking holes in someone else's software. However, with a little discipline in the user organization and a little bending of requirements, a standard package can be made to work just fine.

You are considered a pioneer in the packaged software industry, but you left the business some years ago. Is this because you were ahead of your time?

Head: Perhaps. Certainly, it was more difficult to gain customer acceptance of software packages prior to the unbundling movement of the early '70s. Also, marketing techniques are

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SOCIOLOGY OF COMPUTING/ Robert L. Glass

A Tale of Mutiny In a Computing Center

The word itself is a stunner, bringing to mind one of those frightening tales out of the past that no longer seems really threatening. And yet, given a Bounty and a Bligh, there remains the nagging feeling that it could always happen again.

This is the story of a mutiny. In computing. It has its Bounty and its Bligh. We'll call the Bounty the University of Nevada at Audible Chasm (Unac). And Bligh, we'll call Dr. Murfree Jennings.

Murf Jennings is not your standard-issue, sterotype Bligh. Back a semidecade ago, Murf was growing restless under the mantle of his full professorship in computer science at Unac. He still liked raising the consciousness and the computing skills of his computing students, and yet the semester he started his 13th time through his course in operating system principles, the monotony of his relatively canned presentation leaped out and seized him by the jugular. His ivy-covered skills, he realized, were not only getting disgustingly stable, they were also getting rusty.

That very same semester, an opening developed in the Unac Computer Service Center. At the top. Murf Jennings, well motivated for a change, was the successfull applicant.

Eager to scrape the rust off his working knowledge of computing, Murf made the transition at the end of that very semester. Although no one realized it at the time, he had just cast the Bounty loose from its dock.

The Computer Center staff that Murf inherited was as experienced and trusted in their world as he had been in his, and there was no question but that he would keep them. During the first several years of their cruise, Murf and his crew got along exceedingly well together. Murf's academic background gave him a relaxed, easygoing approach to the pressures of management. His direction was not barked out with the pseudo-decisiveness of a skipper uncomfortable in his new role; quite the contrary.

Audibility was the only probelm with Murf's decisions. It was sometimes unclear whether he was making any. The computer center sometimes simply sailed itself.

Murf's tenure as director has reached the duration of his previous professorship when The Problem arose. The Problem, one common to a lot of today's academic institutions, leaped into being cleverly disquised as an Opportunity — the opportunity for the computer center to enlarge its scope of service from the Unac campus to the entire northern half of the state of Nevada. Regional computer centers, operating out of existing academic computer centers, were a politically powerful concept, and the Nevada legislature had regionalized the Unac Com-

(Continued on Page 26)

Problems With Series/1 Cobol Have Solutions

(Continued from Page 25)

output PROGNAME@B. (PROGNAME is the name in the Cobol Identification Division.) If this is not done, the programmer will get an error message when the program is executed, and the file can not be used if the record size is too large.

Important Error

The most important error we have found is one of judgment. IBM has released a system to the general public without training the sales and support staff on its limitations, if they were known at the time.

Many Cobol installations have a recommended 64K to 96K bytes of memory. When you consider that the operating system uses 18K to 32K, the Indexed Access Method uses 18K (more than three files), a simple Cobol program uses 18K to 24K and a large Cobol program can easily require more than 40K how can a customer expect to use two and three terminals in a multitask environment?

If we were to use the IBM Multiterminal Manager, it would decrease the size of our Cobol programs but would use 16K for itself.

Situation Not Hopeless

The techniques we have developed to make this system work could fill a novel. The important thing is, we have more than one installation running. We have found that our Cobol programs run much faster than anyone expected and the IBM Indexed Access Method is also fast. We use our own task master to drive our applications. By using EDL subroutines we can queue any device including the printer, change its page size and other characteristics and print checks, invoices and other special forms without interruption. When the device is dequeued, it may be requeued by another program.

There is an EDL statement that will force an output device to print without interpretation. When this is used, the "@" sign mentioned by Taylor will not cause a line skip.

The main advantage in this operating system is found in its name, Event Driven Executive. Any event (program) can be initiated to run on its own or synchronized with another program. Although it means learning EDL to write and use a complete Cobol system, the extended features of the system are well worth it.

It would take a good Cobol programmer at least three months of hard work to become proficient enough to do just about anything he wants to a Series/1. How long would this take for OS or DOS?

Any software product must go through a period of debugging. Perhaps IBM needed a lot more internal debugging before releasing this product. However, it is our position that this product, the IBM Series/1 with EDX Cobol, has the greatest potential of any GSD product, including the expensive System/38s, not yet out.

The Series/1 can use about any equipment you can think of, and it doesn't have to be IBM's. It can use an RS-232 interface to most terminals and printers, phototypesetting machines, tie to other machines or answer and dial a phone. Control Data Corp. has 64M-to 240 M-byte removable disk drives and high-speed printers for the Series/1 and the list goes on.

When you consider that a small system costs in the low $20,000 range and is equivalent to a System/34 in the upper $40,000 to low $50,000 range, the Series/1 makes an ideal OEM machine for firms that have perfected their own software. Maybe this is why IBM has not poured a lot of user support into the Series/1 and recently lowered its quantity discount from 50 to 20 machines over 18 months.

Moreau is president of Complib, Inc. a software house and consulting firm based in Nashua, N.H.

Mutiny Erupts in Computing Center

(Continued from Page 25)

puter Center before the Unac people had really understood what was to happen.

Murf's laid-back management, which had been a convenience to the staff back when things were stable, now became awkward.

As the load from the regional users grew, the computer center workload edged upward toward the danger line. Scheduled administrative DP jobs interested Murf much less than academic research runs, and the DP report generation runs became the first crisis point of the inevitable explosion.

One evening at 5:30, as the staff members began closing up their offices and heading home, a worried operator dashed out of the machine room. "Payroll is due out tomorrow at 8 a.m.," he blurted, breathing hard, "and Dr. Jennings just lowered its priority before he went home."

The impact of Murf's from-the-hip decision-making was serious. If payroll didn't get out on time, the whole university would be in turmoil. The decision to change payroll's priority had to be reworked.

And the staffer did it. With hardly a second thought.

It is of such decisions that the Fletcher Christians of a Bounty story are born.

When Murf learned the next morning that his decision had been overridden, he blew his academic cool. He fired the staffer who had made the crucial decision.

Process Begins

It was with full appreciation for the dangers of their position that the Mutineers began the mutiny process. They had to back their departed friend, they knew. But how? The chosen solution was a petition, signed by the entire staff. Angrily, the mutineers poured their boiled-over concerns onto paper. Murf, the petition said, had to go. Or else the staff would. All of them.

Happily, Murf's superiors had been alert enough to realize that a real problem was brewing. With the mutineers, they worked out a solution. Murf, having oiled the rust on his academic knowledge, would be offered the chance to return to his full professorship. Not just offered, actually. He would be told to. The situation was sticky, but it didn't have to be embarrassing.

The Bounty, adrift and endangered, responded well to a new a firmer hand on the helm. She steadied, veered toward calmer waters and resumed course.

The mutiny was over.

Software Packages Make Conference Big Leagues

(Continued from Page 25)

now more refined and users are more sophisticated.

Further, I think that today there is a much more hard-nosed, less tolerant attitude on the part of user management towards system development fiascos. Most managers now ask why they should risk time and money on an in-house software project when an outside alternative may be suitable.

What industry developments do you envision for the future?

Head: I can see a much greater future role for industry-oriented joint ventures to fund the development of an application package. This is already taking place in banking and insurance where a consortium of users writes technical specifications, then hires a contractor to produce the application programs.

Is the quality of software packages improving?

Head: Yes, and it is likely to improve still further in the future. The current emphasis on software reliability and software engineering should help package developers deliver even more reliable products than they do today.

Will there ever be a packaged management information system?

Head: To answer that question properly, you would have to define very precisely what you mean. However, generally speaking, if you are talking about a package to meet specific managerial requirements, the answer is "yes." But if you are referring to a type of massive, integrated, large-scale, multiuser system, the answer is a resounding "no"!

Further information on the conference is available from Software Info, Suite 400, 1730 N. Lynn St., Arlington, Va. 22209.

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THE TAYLOR REPORT/Alan Taylor

GSD Structure Related to Broken Promises

Promises regarding computer products — either about delivery, usage or performance — are only as good as the power of the quality assurance people behind them. Quality Assurance should be able to insist that promises have adequate backing before they are announced.

In IBM's General Systems Division (GSD) memory, capability and delivery promises for both the Series/1 and System/38 have been broken with little apology to users hurt and even fewer explanations or reassurances of future reliability. And, while IBM formally refuses to even discuss how these promises were passed by its review procedures, a look at the headquarters structure shows the reason: P. Martin Foley, the division's president, has kept responsible headquarters people in a compromised position. He has also failed to provide them with the dedicated support and monitoring that the lower echelon areas and regions receive.

This is a pity, because the necessary internal changes would have been simple for an experienced new-broom administrator like Foley to make last September. But instead, the organizational structure is now becoming an integral weakness of the GSD.

The key person is one William Tripp, who is responsible for educating people in development techniques for GSD. It's a big job, and seeing that the people have confidence in their own and other GSDers' abilities (even if they personally doubt them) must be a central theme implicit or explicit of such education.

But Foley does not see those duties as worthy of a person's full-time career, so Tripp has other duties, too.

He is also a co-equal with other directors in reporting to vice-president Charles Branscomb's development and manufacturing area. Tripp's colleagues here are Robert Hennis, who looks after both development and manufacturing operations; and Kenneth Coleman, again with two somewhat competing responsibilities — product line strategy on the one hand and evaluation on the other.

Announcements, of course, don't come from this group, but from some form of a secret product review board. But here is where his compromised duties make Tripp's position simply too weak for him to overcome the direct interests of his own boss and those of his colleagues in having their development work approved and their manufacturing tasks kept on schedule.

Claim Withdrawals

Announcements, however, are not the only concerns of quality assurance. In addition, the feasibility of meeting the promises must be monitored after they are made, and they must be checked to make sure they remain safe estimates if there is negative lead time.

In a letter published last month, Foley objected to the April publication by *Computerworld* of what he regarded as stale news about the broken memory and delivery promises of System/38 software [CW, May 5]. His argument was that it was sufficient to tell "users" about the withdrawal in December, but he ignored the fact that the now discredited claims had been widely publicized to nonusers by GSD. He also ignored the question as to how long GSD had been sitting on the news.

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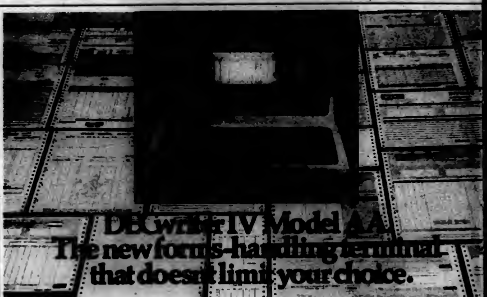
DECwriter IV Model AA
The new forms-handling terminal
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See page 84
in Buy/Sell/Swap

LETTERS

Refreshing Article

We at Christian Management Consulting Services would like to compliment *Computerworld* on "Wang 2200VP Benchmark Results Spectacular" [CW, April 21].

It was refreshing to see some candid comparisons relating to speed and capabilities. We are sorry that we somehow missed seeing the IMB 5110 article. It was also outstanding that although the article and the test were based on machine performance, the article mentioned that the user should also be aware of other aspects that may be just as important.

Again, thank you for this type of needed information.

Don Hatch
San Diego, Calif.

Leap Years

I'm not quite certain why there's all this fuss about watches knowing about leap years and turn of the century and such. Mine didn't even have enough sense to handle daylight savings time adjustment automatically — and I have to do that twice every year.

At least my second channel, which I keep on Coordinated Universal Time (a.k.a. Greenwich Mean Time) weathered that trauma.

Michael D. Shapiro
San Diego, Calif.

Blanks in Fortran

I'm sorry Will Morse is so violently opposed to significant blanks in Fortran [Reader Commentary, May 5]. I think it's a good idea.

I suspect if Morse were to try to cooperate with X3J3 instead of calling its members names, he would get a standard much less objectionable to him. Or did he mean that standards, per se, are objectionable?

Doug Pearson
Mountain View, Calif.

Computerworld welcomes comments from its readers. Letters should be addressed to Editor, *Computerworld*, 375 Cochituate Road, Rt. 30, Framingham, Mass. 01701.

GSD Setup At Fault

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In fact, Foley's explanation left out one important fact — that additional hardware capabilities were announced for the System/38 at the same time. The hardware facilities were, in some cases, essential in order to meet the new software requirements.

Negative Lead Times

As far as I can gather, the System/38 must have had known software "negative lead times" since well before Foley took over the division! A real quality assurance procedure would not have allowed the news of this to be withheld until December when hardware announcements could be made and the unpalatable but at last now possible "forced upgrade" could be sold by the salesmen.

And Foley can change this situation with a stroke of a pen.

In this situation, Divisional Marketing business practices are foundering and, at times, misleading the public. GSD acknowledges the importance of monitoring marketing business practices for the areas *outside* headquarters, but not at the most important place of all — GSD headquarters at 4111 Northside Pkwy., Atlanta!

Legal Area

Moreover, a similar situation is found in the GSD legal area. The regions have their own dedicated attorneys and Security has its dedicated attorney, but Divisional Marketing or Quality Assurance has to rely upon attorneys whose duties and loyalty are split and, therefore, compromised.

GSD is not the only place where promises are made and broken. IBM's broken promises in the middle '60s are notorious. But they were made by top corporate management personally in the face of strong independent pressures.

The structure was there, but the will to use it in crisis was missing. In GSD, until the structure is changed, the public can be expected to be led up the garden path through both ill-supported early promises and, later, through politically covered-up development delays.

You probably know the DECwriter IV for its flexibility in handling paper.

Well, now you can have that same flexibility in handling forms.

The new DECwriter IV Model AA with its snap-in tractor feed option can automatically handle both standard and custom forms. Forms as wide as 14⅞". And as narrow as 3". In up to four parts.

And you can control this new terminal either directly from its keyboard or from a computer.

With the DECwriter IV Model AA you can condense characters down to 16½ per inch. Or expand them up to 5 per inch. On a field of 132 horizontal and 84 vertical tabs. And a simple setting also lets you super-condense lines down to 12 per inch. So you get more information per line, per form.

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Simply remove the tractor feed option and the DECwriter accepts all your roll feed or sheet paper up to a width of 14⅞".

Of course the new DECwriter IV gives you switch-selectable 110 and 300 baud rates. And a 45 CPS catch up rate so you get the true 30 CPS throughput found on our original DECwriter IV Model DA. You also get the extra attention to features you expect from Digital. Like foreign character printing, super/sub-script capabilities, keyboard-selectable local echo, and a print head that moves aside when desired so you can see the last character printed.

Best of all, Digital has put all this capability into a terminal that fits right into a wide range of environments — either on its custom stand or on a desktop. And the DECwriter IV's solid-state components and microprocessor controls continue to build on the reliability standards set by the DECwriter II. All at a surprisingly low price.

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Two Views on Software Reliability:

• One Model Proposed

By Marcia Blumenthal
CW Staff

ANAHEIM, Calif. — The amount of reliability that can reasonably be built into software systems is a question that spawns much debate among computer scientists.

And an impromptu debate was what ensued when Dr. Bev Littlewood, a statistician and computer scientist at City University in London, presented his reliability model at a National Computer Conference session here recently.

Littlewood's model assumed that the contributions from different errors to a system's failure rate vary widely. A system is considered to fail when it does not perform as designed.

Building on this premise, Littlewood theorized that an error in code exercised frequently will cause more frequent failures than a bug in code used infrequently.

Littlewood's scenario concluded that early failures of the program are more likely to be caused by those errors with the greatest failure rates.

By eliminating those errors with the highest failure rates, the pro-

(Continued on Page 32)

• No Breakthroughs Seen

By Tom Henkel
CW Staff

ANAHEIM, Calif. — Current methods of analyzing software reliability are not perfect, and it may be some time before those methods are improved enough to even be classified as good, according to speakers who appeared here recently at the National Computer Conference.

Brought together to discuss current trends in software reliability, the five-member panel seemed to offer little hope for immediate breakthroughs in analyzing software reliability.

Panelists judged inadequate the terminology used to tell programmers what software to develop and said that terminology often causes more problems than the complexities involved in developing software. Furthermore, programmers and software houses do not spend enough time testing software before releasing it to the end user, often allowing unseen errors to creep into DP shops.

And computer models used to analyze software and predict how many errors it contains are at best a new frontier and at worst a joke, according to the panelists.

Many problems associated with software are often created long before program code is actually put into the machine. Current communications methods, such as flow charts, are often worse than English for managers trying to explain what they want their programmers to do, according to Randall Jensen, senior scientist for the Space and Communications Group at Hughes Aircraft.

Calling some forms of communication between programmers and others involved in development "noise," Jensen said the amount of noise in an organization has a direct impact on software reliability. The addition of communications media other

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'Build' Gives Way to 'Buy'

Steps to Package Selection Outlined

By Joseph F. Duggan
Special to CW

The projections for the purchase of software are mind-boggling!

For example, it has been said that by 1985 all programs will be purchased and 90 cents of every budgeted DP dollar will be allocated to the purchase of software. The fast-paced state of the art requires the immediate solutions which only commercially available software packages can provide.

Historically, many companies have unsuccessfully attempted in-house designs and implementations. The reason for these failures was the internal politics involved in this type of major computerization effort. Often after much time and money was invested and no visible return realized, companies wrote off the loss to experience and purchased a software package.

This costly process can be avoided by conducting a complete evaluation of the company's information requirements and needs.

Selection Process

The selection process must be conducted in terms of what it would cost to computerize an application by using your internal staff. This type of comparative analysis consistently proves to management that the purchase of software is the obvious economic choice.

However, each application should be considered independently, as some unique ones can still be done more effectively by your own in-house staff. While such an analysis requires much research, companies can choose from an enormous number of software information sources including Datapro Research Corp., Auerbach Publishers, Inc., International Computer Programs, Inc.'s directory, computer-oriented journals and your computer system vendor's customer service representative.

Despite the availability of this information, much of it tends to be technical and often confusing. Do not underestimate the difficulty in selecting a reliable software package. While it is not a highly scientific area requiring special skills, it does require sound reasoning and prudent judgment.

Therefore, a word of caution is necessary to the non-DP-oriented manager. The lack of good direction could result in a

(Continued on Page 32)

Tandem Unveils Distributed DBMS

ANAHEIM, Calif. — Building upon its previous data base and transaction processing systems, Tandem Computers, Inc. introduced Encompass, a distributed data base management system, at the recent National Computer Conference here.

Encompass was designed to ease on-line application development and ensure data base consistency and recovery in a distributed environment, according to its vendor.

The system gives users of Tandem Nonstop Systems transaction processing and distributed data base control in one package, a Tandem spokesman said.

It also contains transaction logging and blackout functions that guarantee the integrity of the data stored either locally or in geographically distributed sites in a network.

Other Encompass features include distributed audit trails, transaction backout over a dispersed data network, an automatic dump of audit files, on-line backup and enhanced network-wide transaction control facilities.

Because one transaction may affect data stored in multiple locations, Encompass includes a Transaction Monitoring Facility to monitor the many different files accessed or modified by a single transaction, Tandem said.

Encompass allows easy recovery from component and software failures that would necessitate a total data base reconstruction in many other computer systems, the spokesman claimed, adding that only the individual transactions need be backed out.

Licenses for the Encompass Distributed Data Management System are priced at $31,500 plus an $8,500 per processor microcode charge. First release is scheduled for December, the vendor said from 19333 Vallco Parkway, Cupertino, Calif. 95014.

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Steps to Software Package Selection Offered

(Continued from Page 31)

costly and misinformed decision.

Consulting services are available for the software selection process. These services vary in product and price, but the most important characteristic is independence. However, this is perhaps the most difficult quality to ascertain in your search for a consultant because many consulting firms also develop and market their own software.

Since an independent recommendation is required in the selection process, it would be advantageous for management to organize a committee of staff persons responsible for the decision. Included on this committee should be representatives of management, DP and the user's environment.

When management has decided which application is to be computerized, a thorough and detailed analysis must commence. From the analysis of the company's information requirements, a list of system specifications should be prepared, including such information as the function to be computerized, the objective of the system, the type of operating environment, the current user reports and the anticipated enhancements required by the user.

The resulting document, the Computerized Information Systems Specifications report, should be used to elicit information from the software companies on packages that will be most useful in the application area you wish to computerize. Conduct a comprehensive software package survey to find, compare and select the best packages. A Software Selection Survey and Recommendation report should then be written and directed to management.

A cost analysis that compares the cost of an available software package with the cost of developing a system from scratch, should form the basis of another report, the Comparative Cost Analysis report — a document which almost alwsys convinces management of the advantages of software.

Some advantages to purchasing software are fixed risk, immediate return, short lead time to become operational, up-front documentation, minimal investment, state-of-the-art technology and broad flexibility.

On the negative side, users have little if any control over the design of software that is acquired from an outside source. And because such products are usually designed with features geared for mass market appeal, they may require costly modifications to suit an individual installation's needs.

Evaluation Process

There are two major areas of consideration in the selection process; package- and vendor-related features.

Each package must be evaluated in terms of quality of the design, documentation and support. Many packages are poorly designed and are costly to operate on some computer systems.

Often the system maintenance is more tedious and time-consuming than the manual system procedures, a problem that can be avoided by requiring the vendor to give a software demonstration using a sample set of your data on your computer system.

Documentation is critical to the success of any system and determines the long-term successful usage of each software package. Remember, when the vendor has completed the installation process, he is gone for all intents and purposes with the exception of normal maintenance agreements.

Since you did not design the system, your only source of information is what is written in the documentation.

Support is necessary during the installation to ensure a smooth manual conversion. Long-term support is rare; however, if a vendor does provide it, this should be taken into serious consideration.

Besides looking at package features, also evaluate each vendor in terms of location and financial overviews. Location directly determines the level of support that the vendor provides.

Many software companies lack regional support centers. Although they advertise this feature, often after further investigation I have discovered these centers are limited to marketing functions only, with technical support based on the coast opposite from the user.

Because the software industry is highly competitive, the long-term stability of any one company is at best a guess. It is helpful, therefore, to request a Dun & Bradstreet report on each software vendor you are considering.

If you are unable to attain one, a set of current financial statements should be requested of the vendor. Since many software houses are privately owned, a stock answer is that the information is confidential. This may be true, but you should not accept this as a satisfactory answer. I have recommended some highly successful software houses that were privately owned and I encountered no problems in my request for financial information.

In those instances where I was denied financial information, I informed the vendor that the evaluation of his package was being discontinued. Would you make an investment in a company for which you lacked any knowledge?

User List

Suppose you have completed your evaluation process, but are still undecided. Request a user list from the vendor and contact several users in diverse industries and operating environments. If you elicit the problems encountered by the user, you can determine which package is the best.

If a user list is denied, be on your guard. When vendors have satisfied users, they are proud of their user list and advertise it.

Contract negotiations are critical to the successful implementation of any applications package. The best contract which can be written for the user is a milestones payment scheduled contract, under which contract payments are tied to your implementation schedule.

This type of contract motivates the vendor to serve you and never fails to operate as a precautionary measure when vendors get more business than they can humanly handle in a timely fashion. Your installation is never forgotten as long as the vendor has not fully received his purchase price.

Duggan is a senior systems analyst at Sullivan & Cromwell, a New York City law firm.

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I'm Bob Rich,
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Reliability Model Finds Frequent Errors

(Continued from Page 31)

grammer achieves a steep increase in reliability. Uncovering and removing subsequent bugs provides increased reliability, but to a lesser degree than discovering errors with higher failure rates, he reasoned.

Jelinski-Moranda Model

To some degree, Littlewood's model refuted the Jelinski and Moranda model formulated in the early 1970s. This theory assumed that each bug contributes to the overall failure rate of the program by the same amount. The removal of each bug, then, increases the reliability by the same factor.

Probably not by chance, Paul B. Moranda, one of the creators of this early model, was in the well-attended session's audience and offered some tart remarks to Littlewood during a subsequent question-and-answer period. Littlewood, in turn, offered some equally acidic barbs. However, his theory builds on the Jelinski-Moranda model.

Summarizing the reliability conundrum, Littlewood asked whether it is more desirable to have a more correct and bugless, but less reliable program, or a more reliable but less correct program?

His model suggests there is a law of diminishing returns in carrying out heroic debugging. The degree of reliability gained from successive error elimination becomes smaller and smaller, he argued.

Yet Moranda suggested that the most severe errors in a system do not always occur with the most frequency.

From his model, Littlewood concluded the appropriate error-elimination criterion is "dynamic reliability," rather than the number of bugs remaining.

No-Error Systems

However, Littlewood allowed there are situations in which a very high assurance that no errors remain in a system is to be desired — as in the case of a nuclear power station's safety system.

And, as Gerard E. Migneault, a session panelist, stressed, advanced avionics systems is another such case. Migneault is associated with the National Aeronautic and Space Administration's Langley Research Center.

As avionics systems move from analog-to digital technology, there will be greater dependence on stored-program computers and consequently on embedded software, he observed.

The Federal Aviation Administration has advised that catastrophic failure conditions should be "extremely improbable" — on the order of 1 X 10-9 per flight hour.

At the present time, the mean frequency of catastrophic events averages about .9 X 10-6 per hour. However, the fatal accident rate attributed to equipment failure is slightly better — in the range of 1 X 10-7 to 1 X 10-8, Migneault noted.

Estimates Impossible

The suggested standard of 1 X 10-9 failures per hour makes reliability estimates within useful confidence bounds virtually impossible to attain by conventional verification before a system becomes operational. This is because of the number of trials and elapsed time required, he explained.

One approach to increased software reliability is an offshoot of the way hardware reliability is achieved: by building redundancy into the system. However, unlike hardware redundancy, which replicates components, replicating software only reproduces faults.

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609

Informatics Enhances Query Language

LOS ANGELES — Informatics, Inc. has released an enhanced version of the query language for its inquiry interrogation package, formerly known as In?uiry/IMS and now called Inquiry IV/IMS.

Release 4.0 of the package's query language is said to provide improved resource utilization and machine performance. It also has a randomizing algorithim that is said to reduce I/O activity, thus cutting overhead in the message processing partition, the vendor claimed.

IMS/VS has secondary indexing capabilities to provide more efficient call strategies to large data bases. Designed for systems using IBM's IMS, Inquiry IV/IMS uses an English-like language and operates on any terminal supported by IMS/DB and TSO or an IMS/DB/DC system. The DP department can specify the type of security and control, the vendor said.

Release 4.0 of the query language is offered as part of Informatics' Inquiry IV/-IMS maintenance package. Inquiry IV/IMS costs $49,000; the maintenance package costs $4,900, the vendor said from 21031 Ventura Blvd., Woodland Hills, Calif. 91364.

National CSS Adds Text Manager System

WILTON, Conn. — National CSS, Inc. has added a text manager to its remote computer services time-sharing network.

Called Text Master, the package consists of three components: Docu/Master, a data base search and retrieval system; Script/Master, a text processor; and Screen/Master, a screen editor.

Docu/Master is said to provide on-line access to stored narrative material via English-like commands. It also contains full text searching to help users find the appropriate material from a single concept, the vendor said.

Docu/Master information can be displayed on a CRT terminal, printed off-line or routed to files, the vendor added.

Professional Look

Script/Master was designed to give all documents a professional-looking format; it can reformat data retrieved from Docu/Master to fit any layout specifications. Automatic functions include indentation, margin justification, underscoring, centering and hyphenation.

Screen/Master is a cursor-directed editor which can be used for on-line revisions, according to the vendor.

Text Master is offered as part of the firm's time-sharing system and is billed on an as-used basis, from the vendor at 187 Danbury Road, Wilton, Conn. 06850.

System/32s, 34s Get Menu-Driven Document Aid

SANTA ANA, Calif. — An interactive, menu-driven program and procedure documentation system for IBM System/32 and 34 users is available from Application Development Services (ADS).

Known as Docu/Manager, the system is written in RPG II and designed to aid in modifying, developing, standardizing and documenting both application programs and procedures, the vendor said.

Docu/Manager enables users to select specific documentation for libraries, their members or diskettes. Report and update options include cross-referencing file names, field names and comments within procedures, ADS claimed.

Docu/Manager is available for a one-time license fee of $725 for System/32 and $850 for System/34, ADS said from 1700 East Dyer Road, Santa Ana, Calif. 92705.

Art Benjamin Associates Reveals
The Pros and Cons of New Act/1

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HARVEST is our query language and report writer, and is being used by many satisfied customers, some even "novice" computer users, to easily retrieve information from a SEED data base. With SEED and HARVEST, we have endeavored to make it simple for managers to get the information they need, when they need it, and in the form they want it. We are very proud of HARVEST and sincerely believe that using HARVEST you will find it quite simple to retrieve information interactively. You have only to specify the items in the data base to be displayed and the conditions under which they are to be selected. HARVEST will do everything else. We stand behind that statement, and can tell you of many satisfied HARVEST customers.

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For 1,000-Store Food Retailer

QBE Language Cuts Programming Requests 30%

By Rita Shoor
CW Staff

CANTON, Mass. — The DP department at Cumberland Farms, a food retailing operation with more than 1,000 stores, has succeeded in significantly reducing the number of requests handled by its programmers while keeping the managers in user departments "very satisfied."

The key to this apparent paradox was the installation of IBM's Query-By-Example (QBE) program product in February 1979.

At that time, it was estimated that QBE would eliminate approximately 30% of the typical requests for one-time reports and analyses, according to Bruce Weir, vice-president of DP. Although specific statistics have not been generated, "it looks like that estimate is good."

QBE is a user-oriented language which allows non-DP personnel to access data which already exists on various files and organize reports to suit their particular needs.

For example, an inventory manager might compare sales against weeks of inventory on hand in order to identify stores with excessive inventory. By off-loading this type of request to the user areas, Cumberland Farms has cut down on the paper being generated on a weekly or monthly basis and, at the same time, increased programmer satisfaction.

As Weir put it, "No programmer enjoys programming a listing when he could be working on a new system."

The determination as to whether a particular request can be handled via QBE is made within the DP department. While there are no documented guidelines for deciding whether QBE is appropriate for each request, the general rule is that "if QBE can be used, we use it."

User Training

User training is handled by technical support personnel under the direction of Robert Faber, technical support manager. The course consists of four two-hour sessions including lectures and hands-on time at the terminals.

"QBE will never replace CICS," Faber noted, "but we're satisfied with the system." Weir predicted that this type of product might well be "the wave of the future" in DP shops.

Cumberland initially installed the product on its 2M-byte IBM 370/158 and later expanded to 4M bytes of main memory. The only problems appeared to be caused by the National Semiconductor Corp. Since this has been replaced with Intersil, Inc. memory purchased from Storage Technology Corp., things have run smoothly.

Security considerations have not been difficult since QBE provides a method for controlling access to sensitive data. Weir cited as an example, the fact that the home office payroll is not accessible to unauthorized personnel and said that "the software won't admit that the data exists."

A VM/CMS operating environment, which Cumberland already had, is necessary to run QBE. The product also requires the VM Basic System Extension (BSE) and the PL/I Transient Library. BSE is currently leased at $104/mo., and the PL/I Transient Library costs $30/mo. QBE costs the company $325/mo, Weir said.

Screen Editing Fits PDP-8 Mini

OAK PARK, Ill. — An editing program from Dewar Information Systems Corp. (Disc) offers full screen-editing for Digital Equipment Corp. PDP-8 minicomputers.

Features of the Vista program include version maintenance with audit trail, full wordwrap, multiple named pickup/putdown areas and iterative search and replace.

A video characteristics module (VCM) is said to let Vista communicate with video display terminals in a device-independent manner.

The program licenses for $150 from Disc at 221 W. Lake St., Oak Park, Ill. 60302.

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*Material Requirements Planning, a component of Cincom's Closed Loop Manufacturing System

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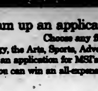

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Two ways to win. Actually, there are two contests in the "YOU CAN DO IT" Sweepstakes—one for end-users and one for OEMs and systems houses. You can enter either or both as many times as you wish. Both grand prize winners will be transported on an all-expense-paid trip-for-two to wherever in the world their applications specify—and both will actually DO IT!

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To be eligible, entries must be postmarked by June 30, 1980 and received by July 7, 1980. Sweepstakes open only to residents of the U.S.A. excluding employees of MSI Data Corporation and its advertising and promotional agencies and their families. Sweepstakes are subject to all Federal, State and Local regulations; void where prohibited by law. MSI is the sole judge of appropriateness and quality of all entries, all decisions are final. All entries and ideas therein become the property of MSI Data Corporation.

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Honeywell Micr System Debuts

NEW YORK — Honeywell, Inc. has introduced a magnetic ink character recognition (Micr) system — an item-processing software package for its Level 6 processors — at the American Banking Association trade show here recently.

Called Micr Plus, the package is said to operate in both a stand-alone or distributed environment, the vendor said.

Users can select. Micr Plus options via an interactive module that reportedly prompts user input. Options include multibank control definitions, endpoint descriptions, report formats, automatic reporting and dynamic file generation.

The Micr document capture system is a group of software programs and routines that interface Honeywell's DHU 9840 document reader/sorters with the Level 6 CPU.

Data output from the reader/sorters is used to build a structured file system, which is accessed by the proof-of-deposit and transit system for subsequent reporting. Items rejected from data capture can be displayed on a CRT terminal, then reentered into the system. The data will be entered in the original sequence, Honeywell noted.

The initial license fee for Micr Plus is $9,500 or $264/mo. Maintenance costs $1,500 annually, the vendor said from 200 Smith St., Waltham, Mass. 02154.

No Advances Seen In Reliability Analysis

(Continued from Page 31)

than simple voice communications — such as flow charts and graphs — only serve to worsen software reliability, Jensen said.

The solution to too much noise in the organization is to limit the interaction among the people developing the software. This means cutting back on team-effort-type developments where a group of programmers is directed by a project leader. This method tends to cut the reliability of the end product, Jensen said.

The group-leader approach also has the disadvantage of giving one employee more power than is in the company's benefit. If the project leader were suddenly to leave his job, the firm could be left in a state of confusion, Jensen noted.

Software testing is another sore spot. Developers spend too little time testing software, and a less-than-thorough test of software at various stages of development can allow undetected errors to slip through.

"It's better to check [software] at each stage to see it's done right the first time," Jensen said, noting that the extra time programmers spend testing usually saves the company money in the long run because it can avoid some later and more costly repairs.

Software Modeling

Programs used to evaluate software via modeling drew the biggest argument of the session. Dr. Bev Littlewood, with the Department of Mathematics at City University, London, said although current models are lacking in many areas, improved versions of the models could be an important breakthrough.

Current software reliability models have several flaws. The relationship between the user and the software is usually unknown, meaning the degree to which poblems are likely to crop up have not yet been adequately quantified, Littlewood said.

In addition, no data fed into a software reliability model can be categorized as typical of the end user's application. As long as that condition exists, any predictions derived from reliability models are useless, Littlewood maintained.

An example of inaccurate readings from software reliability models are test modes where no answer is given or where the answers are too ridiculous to be meaningful, he noted.

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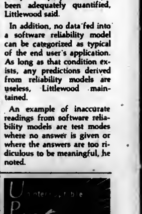
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Users Rate Front-End Software Faulty

By a CW Staff Writer

DELRAN, N.J. — Software looms as the most troublesome aspect of communications processors, according to a plurality of 245 users recently polled by Datapro Research Corp.

The "major difficulty" indentified by 24% of the users was communications proceleor software. About 17% of the respondents gave host system software that distinction, Datapro stated in "All About Communications Processors," a report available for $15.

But 21% of the users said that communications lines irked them the most. Another 17% picked systems expansion — the process of installing extra lines — as their chief problem. Terminals, modems and throughput were called major difficulties by 10%, 9% and 5% of the Datapro survey respondents, respectively.

Communications processor software was rated excellent by

(Continued on Page 40)

USERS' RATINGS OF COMMUNICATIONS PROCESSORS/CONTROLLERS

Processor/Controller	Number of User Responses	Number of Units Installed	Average No. of Lines per Unit	Average No. of Terminals per Line	User Ratings* Overall Satisfaction					Ease of Installation					Throughput				
					WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Hard-Wired Controllers																			
IBM 270X	5	7	10.7	3.7	3.0	2	3	0	0	3.6	4	1	0	0	3.0	1	3	1	0
Memorex 1270	26	36	38.1	3.3	3.7	18	8	0	0	3.6	16	7	3	0	3.6	17	10	0	0
Sperry Univac, all	3	3	6.3	6.5	**	0	3	0	0	**	0	0	1	1	**	0	2	0	0
TOTALS	34	46	24.1	2.0	3.6	20	14	0	0	3.4	20	8	4	1	3.6	18	15	1	0
Front-End Processors																			
Burroughs B874	6	6	9.0	4.6	3.5	3	3	0	0	3.3	2	1	1	0	3.6	3	1	0	0
Burroughs DCP	3	6	35.8	3.6	4.0	3	0	0	0	3.7	2	1	0	0	3.3	1	2	0	0
Subtotals	9	13	29.4	3.8	3.7	6	3	0	0	3.4	4	2	1	0	3.6	4	3	0	0
CCI CC-8	4	13	18.0	2.6	3.0	1	3	1	0	3.0	1	2	1	0	3.3	1	2	0	0
Comten 3650	18	46	20.7	3.6	3.6	10	8	0	0	2.8	4	8	3	1	3.7	12	5	0	0
Comten 3670	11	30	68.7	1.8	3.6	6	4	0	0	3.7	3	7	1	0	3.7	7	3	0	0
Comten 3690	4	6	114.2	3.4	3.8	3	1	0	0	3.6	3	1	0	0	3.6	3	1	0	0
Subtotals	33	82	46.8	3.7	3.6	19	13	0	0	3.1	10	17	6	1	3.7	23	8	0	0
DEC, all	3	4	13.8	10.3	3.3	1	2	0	0	3.0	0	1	1	1	3.7	0	2	1	0
DPF, Inc. CMC	3	3	2.7	6.0	3.7	3	1	0	0	3.7	3	1	0	0	3.7	3	1	0	0
Honeywell 66XX	6	6	38.7	2.0	3.2	1	4	0	0	3.3	1	3	0	0	3.0	1	3	1	0
IBM 3704	34	39	8.3	6.6	3.6	22	11	1	0	3.1	11	16	6	1	3.4	15	17	1	0
IBM 3705	93	161	31.6	6.6	3.4	44	45	3	1	3.0	31	52	10	0	3.2	31	52	8	1
IBM System 7	3	6	14.4	1.6	3.0	0	2	0	0	2.0	0	0	2	0	4.0	3	0	0	0
Subtotals	129	198	18.3	6.6	3.6	66	66	3	1	3.0	32	66	27	1	3.3	48	69	9	1
ITT Courier VTLC	4	4	1.0	6.0	3.0	1	3	1	0	3.6	3	3	0	0	3.6	3	3	0	0
Memorex 1380	4	4	62.6	4.3	2.6	0	2	3	0	2.6	0	3	0	1	3.3	1	3	0	0
Periphonics T-Comm 7	8	7	12.3	4.1	3.0	0	3	0	0	2.8	1	1	3	0	3.0	1	3	1	0
All Others	16	20	29.6	3.4	3.1	5	7	3	1	3.7	3	8	4	1	3.1	3	12	1	0
TOTALS	211	356	25.6	4.0	3.4	101	98	6	3	3.0	55	108	40	6	3.3	86	109	13	1

*User ratings report the number of users responding Excellent (E), Good (G), Fair (F) and Poor (P) for each category. The weighted averages (WA) were calculated by weighting the four ratings on a 4, 3, 2, 1 basis.
**The Weighted Average is considered invalid if based on fewer than three responses.

Charts Courtesy of Datapro Research Corp.

The chart above and another chart on Page 40 summarize user responses to Datapro Research Corp.'s survey on communications processors and controllers. Only one model had a perfect score in overall satisfaction: Burroughs Corp.'s DCP.

Systar Unveils X.25 Package For Series/1

SAN JOSE, Calif. — An X.25 network communications package designed for operation on the IBM Series/1 minicomputer is available from Systar Corp.

CMX contains protocol handlers for IBM 3270 and teletype-compatible terminals and packet networks using the X.25 protocol. The system is intended for customized terminal cluster, host front-end, private network interface or protocol conversion applications, the vendor said.

CMX contains a communications supervisor and a set of modules supporting the X.25, 3270 bisynchronous and asynchronous protocols. It also allows the addition of user-written programs that request services pro-

(Continued on Page 40)

Rate Increase Imminent From Bell

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — A rate increase of slightly more than 5% was imminent from AT&T recently after the Federal Communications Commission (FCC) allowed the company to increase its rate of return from 9.5% to 10.5%.

Below are estimates indicating what the new charges will be for specific services:

Wats: Full Business Day (FBD) service, permitting calls anywhere within the contiguous U.S. from New York, now costs $1,675/mo. The new rate is $1,769. In either case, it covers 240 hours of use.

The charge for each extra hour rises from $4.65 to $4.91. Measured Time rates increase from $245/mo to $259/mo, and extra-hour charges from $18.38 to $19.42.

- Private-Line Service: A two-point voicegrade circuit between New York and Chicago now costs $629.12. The new rate is $665.98. New York-San Francisco rates for equivalent service will rise from $1,444.80 to $1,524.46
- Dataphone Digital Service (DDS): Two-point DDS, New York to Chicago, will rise from $1,141.78/mo to $1,207.18/mo. Between New York and San Francisco, the new rate is $2,065.66 vs. $1,957.46 presently.
- Overseas voice service: A three-minute weekly, customer-dialed call from the U.S. to London will increase from $4.50 to $4.80. To Japan, the new rate is $7.80 vs. $7.35 presently.

These figures are approximations because they are based on a

(Continued on Page 42)

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Communications Software Rated Most Irksome

(Continued from Page 39)

16% of the respondents and good by 60%. In a similar survey conducted a year ago, such software was rated excellent by 21% and good by 51%, Datapro noted.

Nevertheless, more than 93% of the respondents in the latest survey gave their front-ends overall satisfaction ratings of excellent or good. The average satisfaction rating for all the front-end models under consideration was 3.4, where 4 signified excellent, 3 good, 2 fair and 1 poor.

Most of the processor models scored high marks in hardware reliability. The most reliable front-ends were indicated to be Burroughs Corp.'s B874 and IBM's 3704.

But the B874 shared a dismal 2.0 average in technical support with Computer Communications, Inc.'s CC-8 front end and IBM's System/7.

In fact, the lowest marks in the survey were given under the categories of manufacturer's software and technical support.

And no vendor did as poorly as Digital Equipment Corp. from those standpoints. On the basis of three user responses, DEC front ends earned 1.3 and 1.5 average scores in support and software, respectively.

In stark contrast to the generally low averages in the software category, the Burroughs DCP had a perfect 4.0 average — well above the 2.9 average for software of all front ends taken together. The DCP also got a 4.0 average in overall satisfaction.

One major development is recognition that data communications functions should be separated from other DP functions, the firm continued.

"This resulted in modular communications software packages and communications interfaces that permit alteration of the communications environment without major surgery to the hardware and the software."

"Several major developments have led to the dramatic increase in the use of communications processors, and to their continual development into machines with progressively higher capacity, capability and compatibility," Datapro observed.

Another major development is the advent of microprocessors. "The fact that the costs of transmission facilities have not decreased as rapidly as [the costs of] microprocessor-based processing justifies placement of communication processing equipment not only at the host site, but throughout the data communications network," Datapro stated.

The trend toward decentralized DP "has given rise to a new type of [DP] module: the small processor or minicomputer which performs both data and communications processing," Datapro noted.

A third influence on the development of communications processors is the campaign to standardize equipment.

Communications processors do not represent a new concept in systems design, the firm said. Typical applications are:

- *Front-end processing,* where the processor replaces a hard-wired communications controller as the interface between the host system and the data network.
- *Line concentration,* where the processor terminates a number of low-speed transmission lines and interfaces them to a few higher speed lines for more efficient and economical communications.
- *Dedicated processing,* where the processor is addressed exclusively to a particular application.
- *Message switching,* where the processor receives messages from remote terminals, analyzes them to determine their proper destination, converts codes and format (in some cases) and routes the messages to receiver units.

"All About Communications Processors" provides details on 84 models and may be ordered from Datapro at 1805 Underwood Blvd., Delran, N.J. 08075.

USERS' RATINGS OF COMMUNICATIONS PROCESSORS/CONTROLLERS (Continued)

Processor/Controller	User Ratings*																								
	Hardware Reliability					Promptness of Maintenance					Quality of Maintenance					Mfr.'s Software					Mfr.'s Technical Support				
	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Hard-Wired Controllers																									
IBM 270x	2.8	0	3	0	0	3.3	1	4	0	0	3.0	2	2	0	0	3.3	0	0	0	0	3.4	2	1	1	0
Memorex 1270	3.1	10	6	0	0	3.0	10	6	2	1	3.2	13	10	0	1	1.1	0	0	3	1	2.1	6	11	4	1
Spare Units, all	**	0	1	1	0	**	1	1	0	0	**	1	1	0	0	**	0	0	1	1	**	0	1	1	0
TOTALS	2.8	23	11	1	0	2.4	11	12	2	1	2.4	17	12	3	1	2.3	0	0	3	0	2.1	11	13	0	1
Front-End Processors																									
Burroughs B874	2.0	3	1	0	0	3.0	1	2	1	0	3.0	1	3	1	0	2.2	3	1	1	0	2.0	0	1	3	1
Burroughs DCP	3.7	0	1	0	0	3.3	1	2	0	0	3.3	1	2	0	0	4.0	2	0	0	0	3.0	1	1	1	0
Subtotals	3.1	3	3	0	0	3.1	0	4	1	0	3.1	2	4	1	0	3.4	0	1	1	0	3.4	1	2	0	1
CCI CC-8	0.0	1	0	1	0	2.5	0	2	2	0	2.3	0	0	2	0	2.2	0	1	3	0	2.0	0	0	0	0
Comten 3650	3.0	11	0	1	0	2.2	1	10	1	0	2.2	0	10	3	0	2.0	3	11	4	0	2.3	1	0	0	2
Comten 3670	2.0	0	0	0	0	3.2	2	0	0	0	3.0	1	0	1	0	3.0	1	0	1	0	3.0	0	0	0	0
Comten 3690	2.2	2	2	0	0	3.8	2	3	0	0	2.4	2	2	0	0	2.0	0	4	0	0	3.0	1	2	1	0
Subtotals	3.0	19	12	1	0	2.2	31	20	1	0	3.2	8	20	2	0	3.0	8	23	9	0	3.0	2	14	16	2
DEC, all	3.0	1	1	1	0	2.1	0	2	1	0	3.3	0	1	2	0	1.3	0	0	1	1	1.0	0	0	1	2
[illegible]	3.1	2	1	0	0	3.1	1	0	0	0	2.7	1	0	2	0	3.0	0	1	0	0	3.3	1	3	0	0
[illegible]	3.0	3	3	0	0	2.8	1	3	0	1	2.0	1	3	0	1	3.0	1	3	1	0	2.8	1	0	2	0
IBM 3704	3.8	20	6	1	0	2.8	20	0	4	0	2.8	10	11	4	0	2.6	0	23	3	2	2.1	0	10	0	2
IBM 3705	3.1	63	20	0	0	2.2	62	32	17	0	2.3	42	30	12	1	2.8	12	50	10	2	2.0	10	40	34	0
IBM System 7	2.2	2	0	1	0	1.1	0	2	1	0	3.1	1	0	1	0	2.2	0	1	2	0	2.0	0	1	1	1
Subtotals	3.7	61	26	2	0	2.2	82	46	23	0	2.2	61	47	16	1	2.0	16	62	23	4	2.1	20	62	30	0
ITT Courier VTLC	2.2	0	2	1	1	2.0	0	2	2	0	2.8	0	2	1	0	2.5	1	1	0	0	1.1	0	1	0	2
Memorex 1380	2.0	0	4	0	0	3.3	0	3	2	0	3.0	0	0	1	0	3.0	0	1	2	1	3.0	0	2	0	1
Periphonics 1-Comet 7	3.0	2	1	0	1	2.2	0	2	1	1	2.0	0	0	0	1	3.0	1	0	1	0	3.0	0	2	2	0
All Others	3.1	2	2	0	0	2.6	2	0	2	0	2.4	3	4	2	4	3.2	2	4	0	2	2.8	2	0	0	0
TOTALS	3.0	131	[illegible]	11	2	2.2	70	60	30	0	2.1	77	91	23	7	2.2	37	118	41	0	2.2	31	[illegible]	62	20

*User ratings report the number of users responding Excellent (E), Good (G), Fair (F), and Poor (P) for each category. The weighted averages (WA) were calculated by weighting the four ratings on a 4, 3, 2, 1 basis.

**The Weighted Average is considered invalid if based on fewer than three responses.

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Systar X.25 Package Runs On IBM Series/1 Minis

(Continued from Page 39)

vided by the protocol support modules for specialized data entry or formating requirements, Systar said.

The CMX communications supervisor, OSI, performs functions for multitasking, storage management, I/O and intercommunication between protocol support modules.

The CMX/X25 protocol support module has been certified for operation on the Telenet network from GTE Telenet Communications Corp., and it performs Level 1, 2 and 3 functions of the X.25 protocol using standard IBM Series/1 communications adapters, the vendor claimed.

Using the CMX/CCP protocol module, a number of IBM 3271, 3274 or 3276 control units may be defined by specifying the lines, control units and terminals in a table-driven fashion, Systar said.

Polling and Queuing

The CCP performs polling and queuing functions in support of the 3270 terminal devices and application programs communicate to terminals without regard to line or terminal configuration, the vendor added.

CMX is available for one-time license fees of $4,800 for CMX/OSI, $3,200 for CMX/-X25, $1,500 for CMX/TC and $4,500 for CMX/CCP. Discounts are available for multiple copies and one year of central support is provided, the vendor said from 1762 Technology Drive, San Jose, Calif. 95110.

To Encourage Innovation

Federal Aid Urged for Communications R&D

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — More federal support of new communication satellites, solid-state electronic and on-line information services for the home is needed, an industry spokesman said here late last month.

Dr. Richard Marsten, who heads the Institute of Electrical and Electronics Engineers' committee on telecommunications policy, appeared at a hearing convened by two subcommittees of the House Science and Technology Committee.

One aim of the hearings is to find out whether new legislation is needed to encourage innovation in telecommunications technology.

The National Aeronautics and Space Administration (Nasa) "led the world" into satellite communications technology, Marsten pointed out, but when Nasa's program was shut down in 1973, it provided an opening for Europe and Japan.

"Today, they are each spending hundreds of millions of dollars to overtake our leadership, which we believe they could do by the end of this decade if the Nasa program is not reestablished and rapidly expanded to include flight projects."

Government Support

Since no American company, on its own, can afford to develop and demonstrate new communication satellites, direct government support is essential, Marsten contended.

He added that 40% of Japan's very large-scale integration (VLSI) development costs are being financed by the government. To counter the threat posed by that investment, this country needs a program of government incentives, he added.

For example, Marsten proposed rapid depreciation to encourage turnover of capital equipment, capital investment credits to encourage investment in new tooling and manufacturing equipment and reduced income taxes on the sales generated by that equipment during the first few years it is in operation.

These incentives "should be applied to. . . telecommunications research and development in all areas, not just VLSI," he said. Government incentives for new products, such as on-line home information systems, can help counter declared foreign competition.

Within the next five to 10 years, "It is possible to project a revolution in information transfer to the consumer's home," Marsten added. "This will no doubt involve some type of microcomputer. . . It would be a serious loss for the U.S. if home and small business microcomputers went the way of the television and radio industries."

Direct Subsidies

In most cases, government support of telecommunications R&D should be in the form of tax and other incentives rather than dollars, Marsten said. "We believe [direct subsidies] should only be considered in conjunction with the development of new, high-risk technologies that suggest new kinds of special applications and not as an ongoing government program that would appear to compete with industry."

He cited Nasa's applications technology satellite (ATS) and communications technology satellite (CTS) programs as examples. "ATS-6 and CTS demonstrated satellite broadcasting technologies for the first time and invaded new radio-frequency bands for the first time; their user experiment programs focused on the special applications these new technologies made possible."

Marsten also said that if the federal government invests directly in telecommunications R&D, there should be a "buy-back or refund" percentage on any resulting commercial products. The government could then use this money to help finance additional R&D activity, he explained.

Federal support, regardless of whether it is direct or indirect, should be provided without "active government participation in the operation of successful commercial enterprises," he added, and there should be a minimum of reporting required.

According to Marsten, 18% to 50% of the costs of a typical federal contractor's costs are consumed by documentation. "Even at the low end, that is too high permit competitive market pricing."

Industry Requirements

Marsten's key point was that government support for research and development "in some telecommunications areas" is needed, but it will be acceptable to industry only if certain requirements are met. Simplified reporting is one. In addition, such support must "not violate antitrust regulations," and it must "protect a company's competitive posture."

Two other participants in last month's hearing — Drs. N.B. Hannay and A.A. Penzias of Bell Telephone Laboratories — carried this thought further. In a joint statement, they said:

"A high level of innovation is essential for the U.S. to maintain its leadership in telecommunications. The Bell System as one of the established carriers, has a special role and capability. . . in this process.

"The vertically integrated structure of Bell. . . has contributed in important ways to its demonstrated record of innovation. In such a structure, all elements of the innovative process are tightly coupled.

"Close technical interaction among the scientists and engineers. . . involved in research, development and manufacture is vital to rapid and productive innovation."

USPS' EMS Awaits Action

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — Legislation permitting the U.S. Postal Service (USPS) to develop and test an end-to-end electronic mail system (EMS) now awaits final action in the Senate.

Commercial vendors of electronic mail and message services have long-opposed this idea, contending that it would lead to a commercial offering putting the federal government, through the Postal Service, in direct competition with private industry.

Efforts to amend the pending Senate bill H.R. 826 before or after it reaches the Floor were reportedly under way at presstime. Senators Howard Cannon (D-Nev.) and Ernest F. Hollings (D-S.C.) were said to be directly involved. Cannon heads the Senate Commerce Committee and Hollings chairs its Communications Subcommittee.

According to a knowledgeable source, the controversial research and development provision probably will be removed during consideration of H.R. 826 by the full Senate. But that is only because "USPS believes it already has authority to develop and test an end-to-end electronic mail system."

The key question, added the source, is whether efforts to pass another amendment, now being drafted in the Senate Commerce Committee will be successful.

Reportedly, the aim of this amendment is to concentrate Postal Service activity at the devliery end of the electronic mail path. It would bar development of an end-to-end EMS system, but encourage USPS to work on improved interfaces with commercial EMS networks, better facsimile equipment and more efficient methods of delivering electronic messages in hard-copy form.

So far, industry's major objections to the pending bill has come from the Ad Hoc Committee for Competitive Telecommunications (ACCT), which represents most of the nation's specialized common carriers.

In a recent letter to Sen. Abraham Ribicoff (D-Conn.) — chairman of the committee that considered H.R. 826 after it passed the House several months ago — ACCT President Herbert N. Jasper pointed out that the bill "goes far beyond" positions publicly taken by the Postmaster General and the USPS Board of Governors, reference to statements by both that the Postal Service has no plans to "participate" in end-to-end electronic mail services.

The bill "is also contrary to the [Carter] Administration's recommendation which would prohibit the offering of end-to-end electronic services by the Postal Service," Jasper added.

In an explanatory report that will accompany H.R. 826 to the Senate Floor, Ribicoff's Committee on Governmental Affairs said the controversial R&D provision contains "no implication of committee authorization or approval regarding any future marketing activity by the Postal Service in any aspect of electronic mail services."

Furthermore, the service must keep Congress apprised of its activity in this area. As the report pointed out, specifically requires USPS to submit its R&D plans for electronic mail to Congress by Jan. 15, 1981.

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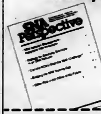

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Terminal Flattened

Florescent displays may soon find their way into data communications shops. The above 240-char. alphanumeric unit from Noritake Electronics in Santa Ana, Calif., employs a 5 by 7 dot matrix.

Bell to Raise Rates by 5%

(Continued from Page 39)

rate increase of 5.64%. That was the amount AT&T originally requested, beginning in June. The FCC, however, allowed the phone company only a 5.12% increase.

Second Increase

AT&T, in its original application for higher rates filed last March, also asked for a second increase, to be effective next October. The two rate hikes, together, would raise preexisting charges 10.5% overall.

The commission rejected the increase proposed for October and reduced the June hike from 5.64% to 5.12%.

AT&T's original request is still under consideration at the FCC, however, so another rate increase within the next year is still possible.

Essentially, the commissioners are considering whether the phone company needs a rate of return greater than 10.5%, the amount they authorized late last month. They may reach a final decision on this question by the end of the year.

Judging from the vote late last month authorizing the 5.12% increase, there is a strong chance of another increase. The vote was 4-3. The dissenters — commissioners Joseph Fogarty, James H. Quello and Anne P. Jones — wanted to accept AT&T's original proposal.

The opposition was led by Chairman Charles D. Ferris, who did not "fully understand why a company which had profits of more than $5 billion last year needs higher earnings. Ferris noted that the market price of AT&T stock has risen more than 10% recently.

Commissioner Quello replied that AT&T shareholders could obtain a significantly higher dollar return by investing in tax-exempt bonds, without any liability for federal income tax.

Memory Boosted On PE Terminal

FLANDERS, N.J. — The Perkin-Elmer Corp. Model 3500 terminal has been enhanced to feature 16K bytes of main memory and two microfloppy disk drives with a total of 320K bytes of secondary storage.

The disk drives allow the terminal to store application software, transaction screen formats, operator-entered data for batch communications with a remote host and data for local printing, Perkin-Elmer said.

PE's Model 3500

The 3500 can operate as a synchronous or asynchronous remote batch terminal over the dial-up telephone network.

Screen Generator

The terminal's Screen Generator software can be used to develop typical transaction processing systems and reduces development time for screen formats and the associated data entry and retrieval functions, the vendor added.

The Perkin-Elmer Terminal Operating System (Petos) resides in 20K bytes of read-only memory and requires 3K bytes of main memory, a spokesman said, adding Petos provides 18 commands which control devices and files and determine the status of hardware and software.

The 16-byte version with two microfloppy disk drives lists for $6,783 and has a 60-day delivery, the vendor said from its Terminal Division, 360 Rt. 206 S., Flanders, N.J. 07836.

On June 30th, Computerworld will show you how to evaluate and choose systems and utility software packages.

Don't miss this Computerworld Special Report, *Systems and Utility Software*—Ad close is June 13th.

With the ever-expanding number of software packages available, finding the best one for your needs can be confusing.

In this Special Report, edited by Marcy Rosenberg, we'll answer the important questions for selecting software such as:

- How to evaluate the various types of systems and utility packages.
- How to choose a supplier.
- When to stick with software supplied by the hardware vendor—and when to turn to independent software developers.

You'll also read accounts of user experiences, tutorial essays, the legal aspects to consider when negotiating contracts with vendors, reviews of current products and speculations about future trends.

If you're an MIS executive, DP manager, Supervisor or Programmer, you'll find our June 30th report especially valuable. If you market systems or utility software—your ad should be there. Don't forget, ads must be received by June 13th. To reserve space, call your Computerworld sales representative or Frank Collins at (617) 879-0700.

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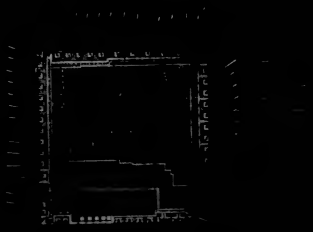
Computer Advances

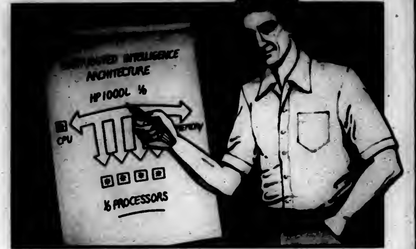
Vol. 5 No. 3 June 1980



SOS lowers cost, speeds I/O in new HP 1000 L-Series

Many low-cost computer applications are so I/O-intensive that the sheer volume of input/output transactions can degrade overall computer performance despite a high CPU instruction rate.

We designed the HP 1000 L-Series computer, newest and least expensive of the HP 1000 family, so that CPU and I/O instructions are processed separately. This "distributed intelligence" architecture provides high performance in both dimensions. And because this performance is achieved with silicon-on-sapphire LSI technology, it comes at a low cost. The L-Series CPU and 64K byte memory "board set" can be bought for $2,250.*



Multiple I/O processors, each with direct access to memory, speed I/O and free the CPU to perform computation.

Two SOS microprocessors are the brains of the L-Series. One is the central processing unit for the computer; the other is an input/output processor (IOP).

The CPU chip implements the base instruction set common to all HP 1000 computers, making the L-Series compatible with the more powerful M-, E- and F-Series HP 1000s. Also implemented on the CPU chip are a real time clock and the memory protection facilities necessary to support real-time multi-programming applications. The IOP, one of which runs each interface board in the L-Series, accesses memory directly, and performs other "housekeeping" functions so that the CPU is free to compute.

This architecture was made possible with the SOS technology that only HP, among major chip and computer makers, has delivered in commercial products. The crystalline structure of SOS allows devices to be packed very densely on the chip and to be operated at high speeds. SOS has shrunk the parts count in the HP 1000 from 337 in previous family members to 67 in the L-Series. The result is higher reliability as well as lower costs.

I/O power on a card

The HP-IB interface card makes the fullest use of the L-Series exceptional I/O power. The board has two SOS chips—an IOP and a special processor to control the interface protocols of both the 1975 (low speed) and 1978 (high speed) IEEE 488 standards. The benefit is that a single HP-IB card can interface with up to 14 instruments, or the same card can be used for connecting a wide variety of peripherals, including fixed and removable media hard discs, flexible discs, and printers. This interface saves I/O slots and power.

For users who wish to implement special I/O cards, a breadboard card supplies the IOP and space for custom logic or microprocessors. Other cards interface with asynchronous serial (RS-232C and 449) devices, and make high-speed parallel transfers. A storage module provides up to 64K bytes of UV-erasable PROM storage of user

◀ *Cover*

The HP 1000 L-Series central processor provides many system level functions integrated into a single silicon-on-sapphire (SOS) chip.

programs and data; this card can eliminate the need for peripheral memory devices, allowing the L-Series to be operated in harsh environments.

Real-time operating software

The L-Series operating system, RTE-L, is a comprehensive subset of the RTE-IVB real time multiprogramming system introduced for the HP 1000 family last year. RTE-L will support program development in FORTRAN, BASIC, and assembly language, and will execute programs written in PASCAL. It can manage on-line and background batch processing simultaneously. Systems can also be developed on an RTE-IVB machine and loaded into the L-Series.

Configurations

The simplest L-Series system, the 2103LK, consists of a set containing the CPU board and a 64KB memory board. It sells for $2,250.* The OEM user can add a power supply, a 5- or 10-slot card cage, and interface boards.

The L-Series also comes as a rack-mounted computer, the 2103L, with processor, memory board, and 8 I/O slots, for $4,450.* A complete system, the HP 1000 model 10, includes the L-Series computer with 64KB of memory, RTE-L, a 1.2 Mbyte flexible disc, 12 Mbyte fixed disc console and cabinet. It costs $22,500.*

Please check A on reply card for L-Series literature.

*USA domestic price only

DMA saves CPU cycles

Since each interrupt by an I/O device can cost the CPU up to a millisecond of computing time, the key to I/O performance is to minimize the number of interrupts. Direct memory access (DMA) requires only one interrupt for an entire block of characters and thus offers significant advantages over the normal method in which the CPU is interrupted for every character transferred. The I/O processor on every L-Series interface card provides DMA at a very low cost.

Setting up an I/O transfer under DMA is fast and simple. Only three pieces of information are usually needed: a buffer address that tells where the data will be transferred to or from in memory; a word count that tells how much data is to be transferred, and a configuration word that specifies how the information is to be transmitted to the interface card.

Three instructions will enter control words into three registers on the IOP chip, and a fourth instruction starts the transfer. The IOP takes care of all handshaking protocols with the peripheral device. Information is transferred to memory on a cycle-stealing basis, and the IOP interrupts the CPU only when the transfer is complete.

Chained DMA transfers

Another way to set up the interface card for a data transfer is to use the IOP's "self-configuring mode" for multiple transfers. In this process, the program tells the IOP where in memory the three control words are located, and the IOP can configure itself for the transfer by loading the words into its own internal registers.

With this approach, the IOP can check at the end of each transfer to see if another transfer is required, and then configure itself to perform the next operation.

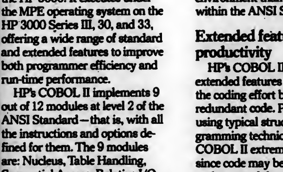
DMA itself eliminates about 95 percent of CPU interrupts; chained DMA saves two-thirds of the remaining interrupts.

Since it has an IOP on every interface board, the L-Series computer has DMA capability on every I/O channel. Because of this feature, the I/O programs in RTE-L use DMA for all low-speed as well as high-speed transfers, resulting in a significant increase in overall processing efficiency. Total DMA bandwidth is 2.7 Mbytes/second.

High-level implementation of 1974 ANSI COBOL

COBOL II/3000 is one of the most complete implementations of the 1974 ANSI COBOL Standard for any system in the price range of the HP 3000. It executes under the MPE operating system on the HP 3000 Series III, 30, and 33, offering a wide range of standard and extended features to improve both programmer efficiency and run-time performance.

HP's COBOL II implements 9 out of 12 modules at level 2 of the ANSI Standard—that is, with all the instructions and options defined for them. The 9 modules are: Nucleus, Table Handling, Sequential Access, Relative I/O, Indexed I/O, Sort-Merge, Segmentation, Library, and Inter-Program Communication. This level of implementation provides a wide range of industry-standard features to maximize programmer effectiveness within the COBOL environment.



In place of the Debug and Data Communication Modules defined by the ANSI Standard, COBOL II offers interactive debugging through MPE Debug and data communications through DS 3000. These facilities are simpler to use in an HP 3000 environment than those defined within the ANSI Standard.

Extended features improve productivity

HP's COBOL II/3000 offers extended features which reduce the coding effort by eliminating redundant code. Programmers using typical structured programming techniques will find COBOL II extremely efficient since code may be written once and accessed thereafter by a single identifier.

☐ The Multiple Entry Points to Subprograms feature allows similar functions to be coded into a single subprogram. This subprogram is accessed by entering at various sections of the code and executing only the portion appropriate to the function.

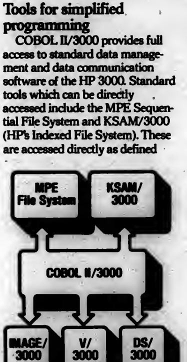
☐ Preprocessor Functions help reduce the amount of redundant code a programmer must write, through the use of a macro capability. The user can equate a specific section of code (through $Define) or a file (through $Include) to a single identifier. When this identifier is referenced in a program, the compiler will automatically replace it with the referenced code.

Easy access to system capabilities

COBOL II/3000 is designed to allow users to access powerful MPE operating system features through CALL procedures without having to write system-level interface routines. The result is simplified access to a broad range of HP 3000 operating system features, with a reduction in coding effort and system overhead.

Tools for simplified programming

COBOL II/3000 provides full access to standard data management and data communication software of the HP 3000. Standard tools which can be directly accessed include the MPE Sequential File System and KSAM/3000 (HP's Indexed File System). These are accessed directly as defined



within the ANSI Standard to simplify the programming effort.

In addition, COBOL II interfaces to the other HP 3000 data management and data communication tools through library procedures, thus increasing the overall capabilities of the programmer. These tools include IMAGE/3000, HP's data base management package, V/3000, which is used to generate and access complex screens for data entry, and DS 3000, which is used for data transfer between systems.

Microcoded instruction set improves run-time efficiency.

Data management extensions to ANSI Standard

In addition to providing access to the data management tools of the HP 3000, COBOL II implements special extended features which simplify the complex programming effort normally required for elementary data manipulation. An example is the ACCEPT-FREE statement, which allows users to invoke terminal input of single fields. The user merely inputs the data, and COBOL II does the editing and formatting.

Ease of conversion

COBOL II—with its high-level implementation of the ANSI Standard and widely used, packed decimal data format—provides most of the programming features available in the industry, thus simplifying conversion to the HP 3000.

In addition, HP has provided a simplified conversion path for existing customers by means of an upward compatibility of features. All features available under COBOL/3000 are supported by COBOL II/3000 through the 74 ANSI Standard implementation or through language extensions. The only changes a user must make are when new reserved words, defined for the 1974 Standard but not for the 1968 Standard, have been used as identifiers in a COBOL/3000 program.

To simplify making these changes, a conversion guide and program are provided. The guide lists all the new reserved words as well as all the new features of COBOL II/3000 which were not available under COBOL/3000. The conversion program, described in the guide, automatically flags any of the new reserved words being used as identifiers in the COBOL/3000 program. The programmer can then simply change the flagged statements and recompile under COBOL II.

Increased performance through firmware

COBOL II offers improved run-time performance through the implementation of a microcoded instruction set. This instruction set optimizes run-time performance of frequently utilized code for subroutine access, data manipulation, and editing.

In tests run in a batch environment, improvements in the range of 10 to 20 percent for execution time were observed. Tests run in an on-line environment yielded execution times equal to or slightly better than those written in COBOL/3000. Performance comparisons with COBOL/3000 may vary depending on the exact application.

The microcoded instruction set, along with the high-level implementation of the ANSI Standard and COBOL II's many extended features, reaffirms HP's commitment to high-technology software products designed to increase programmer productivity and improve run-time performance.

For more information check B on reply card.

Data base management—on a desk top

The first data base management system (DBMS) implemented on a desktop computer—the HP System 45—will reduce programming costs and improve data integrity, access and security for a wide range of scientific, technical and industrial users.

At the heart of System 45 DBMS is IMAGE/45, a subset of HP's user tested and approved IMAGE/3000, one of the most widely installed DBMS packages in the world. IMAGE/45 provides 26 new BASIC statements and routines in ROM for managing the data base. It enables you to build, maintain, access, re-structure and back-up a data base without writing special application programs.

IMAGE/45 provides great flexibility in data base size: up to 32 data sets per base and 32,767 records per set. Within each 1,022 byte (max.) record, you can have up to 127 fields.

System 45 DBMS uses a chained approach to data retrieval in which pointers logically connect records having common attributes. This allows cross-referenced access to collections of data and ensures fast access to related data by key values.

Included in System 45 DBMS is QUERY/45, a highly interactive and powerful data access and manipulation software package—written using IMAGE/45 tools—that enables you to access your data base without writing BASIC programs. QUERY/45 facilitates "ad hoc" or unanticipated data base inquiries through the use of user soft keys, "help" files and a system information file. QUERY/45 is divided into six software modules that contain the primary data access routines:

☐ DEFINE, allows you to create or modify a data base while being prompted from the CRT screen.

☐ SHOW, provides a graphic "picture" of the data base structure.

☐ SEARCH, allows multi-criteria data selection (including computed or partial value searches). Searches are done using "threads" that link sets with common key values.

☐ UPDATE, allows you to add, delete or modify data with or without a pre-defined form.

☐ FORMS, allows you to create new forms to be used with UPDATE, or modify old ones.

☐ FRAMEWORK, allows QUERY/45 to function as a front-end to user written programs. Your program can use QUERY/45 to select and sort data from the data base.

Reduced costs

System 45 DBMS lets users modify a data base with a minimum of programming effort because the data is defined independently of the application programs. Moreover, QUERY/45 can serve as a direct replacement for many applications programs.

Improved data integrity and security

System 45 DBMS allows independent files to be consolidated into a centrally located set of files. This ensures that the most current information is maintained. It eliminates the problems associated with multiple users updating multiple versions of the same file.

Powerful error detection and recovery routines are also provided. If a data transfer is interrupted for any reason, the data base is flagged "corrupt," since the pointer updates may not have been completed.

A system of passwords, maintenance words and named values provides excellent data security for System 45 data bases.

Link to HP software

To simplify statistical processing, QUERY/45 provides a program that lets you reformat data from the data base and then automatically pass that data to programs from the HP Statistical Software Library.

System 45 DBMS is powerful and easy to use. It doesn't just put your data on file…it puts it to work.

The System 45 DBMS includes firmware, software, manuals, a practice data base and a data base design kit and costs $5,000.

For further information, check C on the reply card.

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COMPUTER PERFORMANCE

(AND HOW TO MAXIMIZE IT)

The distance between DP and top management grows wider, but a "central control" function could bridge the gap. Here the author develops a control model that integrates budget, price, schedule, task sequence and value considerations. The result is a workable structure for both DP and top management to evaluate — and maximize — computer effectiveness.

Since computing represents only one of the activities of an organization, organizational headquarters must determine the total organizational budget and the percentages of the budget to be allocated to computing and noncomputing uses. The procedure that is adopted to assign funds to particular uses is termed *internal capital rationing*. Two types of capital rationing are defined by Bierman and Smidt:

1. A cutoff rate of return that is higher than the organization's cost of money is determined. Investments yielding returns greater than the cutoff are accepted, assuming that sufficient funds are available at the organization's cost of money, whereas investments with a return lower than the cutoff are rejected.

2. The total amount of funds committed to particular uses in a given period is limited to a specific quantity. The amount may be determined as a result or a present value of a rate-of-return analysis.[1]

A basic premise is that organizational headquarters is aware of all profitable investment opportunities and that its objective is to maximize the profit from its activities by assigning funds effectively to both computing and noncomputing uses subject to budgetary constraints. This is shown as the "total budget allocation decision" in Figure 1.

Knowing the value (or return on investment) of all potential investments, organizational headquarters determines how much should be spent on computer-related functions. In a decentralized organization, this decision could be made at the divisional level; headquarters would determine the division's total budget but would not stipulate its specific use. In this case, the process shown in Figure 1 might apply to each division. The computer central control function could still be centralized or not; however, if centralized, it would receive part of its total computing budget from each division requiring computer services. Figure 2 reflects the budgetary decision processes shown graphically in Figure 1 and facilitates the direct comparison of the features of each decision.

The computing budget is defined as that part of the organization's total budget that is devoted to computer-related activities in a given time period. The central control division allocates the total computing budget designated by organizational headquarters between internal and external computing services. This process is identified as the "internal facility vs. external services budget allocation decision" in Figure 1.

The decision as to how money is to be allocated for internal or external computing is based on the values of computer jobs available for processing and the characteristics (such as quality of service, cost of service, and so forth) of both the internal facility and the available external services.

Maximization of the net value of computer jobs run in a given planning period is the objective, as indicated in Figure 2. (The term net value means the value of a job, less the money cost of processing it. The total net value in a given period is the sum of the values of all jobs run during the period minus the amount of the computing budget spent during the period, assuming that the latter includes all costs directly attributable to computing. The opportunity costs incurred are included in the value functions of the jobs in the forms of value losses.)

Assignment of User Demand

Although central control might determine the preferred allocation of computing between internal and external facilities in a given period, the user population (which is assumed to be somewhat autonomous) must be *induced* to use available computing facilities in a manner consistent with the organization's objective of maximizing the net value of all computer jobs run.

This objective is achieved by central control through the use of budgetary control, pricing rules and priority classifications. These three devices can be used to control both the average level of demand for computer services and the distribution of this demand over time for both internal and external computer services. The role of each of the three devices is considered in greater detail elsewhere in this book.

The "user demand assignment decision," shown in Figure 1 and Figure 2 consists of the allocation of a user budget, the determination of pricing rules and the assignment of user or job

(Continued on In Depth/3)

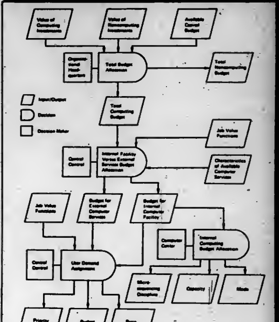

Value of Computing Investments
Value of Noncomputing Investments
Available Capital Budget
Organizational Headquarters
Total Budget Allocation
Total Noncomputing Budget
Input/Output
Decision
Decision Maker
Total Computing Budget
Job Value Functions
Central Control
Internal Facility Versus External Services Budget Allocation
Characteristics of Available Computer Services
Job Value Functions
Budget for External Computer Services
Budget for Internal Computer Facility
Computer Center
Internal Computing Budget Allocation
Central Control
User Demand Assignment
Micro-sequencing Discipline
Capacity
Mode
Priority Rules
Budget Rules
Price Rules

Figure 1. The Bugetary Decision Process

By C. Warren Axelrod

Reprinted from Computer Effectiveness: Bridging the Management/-Technology Gap, *by C. Warren Axelrod. Copyright 1979 by Information Resources Press, a division of Herner and Co., Washington, D.C.*

"We switched to NCR," says Joseph A. Dee of Brooks Camera, Inc.

Joseph A. Dee (left) is president and chairman of Brooks Cameras, Inc. in San Francisco. Jim Sweeney is his NCR Account Manager.

DEE:

Brooks Cameras is the largest photographic dealer in Northern California. And we're growing fast. We just outgrew the processing center that had been doing our computer work. We needed faster turn-around. And we wanted to establish our own priorities.

NCR's SWEENEY:

So you went to your own NCR system.

DEE:

Yes, but not directly. First, we selected a competing vendor's newly announced system. But as we started to plan, we began to see problems ahead. No tape drive. Perhaps no COBOL. Perhaps no match-up with our sales terminals. And all we could get from the supplier were vague assurances that the problems would somehow disappear. So we switched to NCR. Very fortunately, as it turned out, because our NCR system is up and running. While the other vendor is still not delivering the other system.

NCR's SWEENEY:

We are not only delivering, our operating software is fully tested.

DEE:

We had a shirtsleeve session with the NCR software people that was refreshing. They told us exactly where they stood. What we could expect and when. And that's the way it's turning out. They gave us the hard answers.

NCR's SWEENEY:

You liked Migration Path Engineering, too.

DEE:

Our requirements are too unique for us to expect off-the-shelf application software from any supplier. We have every kind of sales transaction. We accept all the regular charge cards as well as our own. We have rentals, repairs and layaways. And our own special promotions. So once we made the investment in our own specialized programs, we wanted to protect it. Even when our growth forces us to move to a larger system. With Migration Path Engineering, NCR can give us that protection.

NCR's SWEENEY:

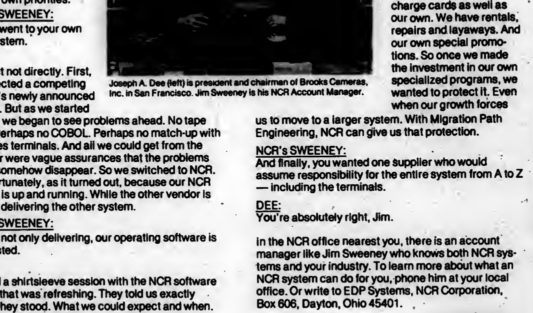
And finally, you wanted one supplier who would assume responsibility for the entire system from A to Z — including the terminals.

DEE:

You're absolutely right, Jim.

In the NCR office nearest you, there is an account manager like Jim Sweeney who knows both NCR systems and your industry. To learn more about what an NCR system can do for you, phone him at your local office. Or write to EDP Systems, NCR Corporation, Box 606, Dayton, Ohio 45401.

NCR
Complete Computer Systems



(Continued from In Depth/1)

priorities. This function provides fine tuning of the coarser "internal facility vs. external services budget allocation decision" and controls the level and timing of demand for, and selection of, computer services through persuasion rather than direct restrictions.

Internal Budget Allocation

Typically, the computer center receives a budget for the provision of internal computer services, namely, capital equipment (buildings, computer hardware) – "capacity" in Figure 1; equipment support (software, operating personnel) – "mode" in Figure 1; and service support (equipment, software and personnel controlling the quality of service) – "microsequencing discipline" in Figure 1. (Microsequencing rules determine the sequence in which jobs that have arrived at the computer center for service are *run*. Macrosequencing is the process by which the sequence in which jobs *arrive* at the computer center is effected. Similar terminology is adopted in V.K. Sahney and J.L. May. *Scheduling Computer Operations*, Computer and Information Systems Monograph Series No. 6, Norcross, Ga., American Institute of Industrial Engineers, 1972, page 5, where "microscheduling" has the same meaning as microsequencing but where "macroscheduling" means the scheduling of work to and beyond the computer room, which is a different concept from macrosequencing.)

Name of Decision (Decision Maker)	Inputs	Constraints	Decision Variables	Objective	Description
Total budget allocation (organizational headquarters)	Value of potential computing and noncomputing investments	Capital rationing	Total computing budget Total noncomputing budget	Maximize net value of all activities	Determination of the total budget available to the organization, and the allocation of the budget to maximize net value in a given period
Internal facility versus external services budget allocation (central control)	Job values with respect to computing service level Internal and external computing characteristics	Total computing budget	Internal computing budget External computing budget	Maximize net value of jobs run in a given period	Allocation of total computing budget between internal computer facilities and external computer services to maximize net value of jobs run in a given period
User demand assignment (central control)	Job value functions Computing budget	Total computing budget not allocated to computer center Internal computing capacity	User budget characteristics User priority characteristics Price structure	Maximize net value of jobs run in a given period	Allocation of general computing demand to maximize net value of jobs run in a given period
Internal computing budget allocation (computer center)	Job value functions Equipment characteristics	Total computing budget	Capacity Mode Sequencing rules	Maximize net value of jobs run in a given period	Allocation of budget among hardware, software, and other resources to maximize value of jobs run in a given period
Macrosequencing (user population)	Job values Prices Budgets Priorities Turnaround	User budgets Budget restrictions	Level and pattern of demand for internal computing Level and pattern of demand for external computing	Maximize net value of jobs run in a given period	Assignment of computing demand by users between internal and external facilities to maximize net value of jobs run in a given period

Figure 2. Budgetary Decisions and Their Features

The goal of the computer center manager is to select a combination of equipment, equipment support and service support that will result in the greatest expected net value of computer jobs run in a given period.

Each user, in selecting when and where to submit jobs and which jobs to have processed, is assumed to respond autonomously to the level of demand for internal computer services (and resultant turnaround time) as it varies over time; to the availability of both internal and external services; and to prices, budgeted funds and organizational restrictions. Users are assumed to respond to exogenous factors to maximize the net value of computer jobs run in a given period, as described for the macrosequencing decision shown in Figure 2 and in the computer usage allocation model illustrated in

This section considers the specific functional relationships that arise from the physical characteristics of the system. These relationships, shown in the computer usage allocation model (Figure 3), correspond specifically to the various time distributions of the system – processing, queuing and

(Continued on In Depth/4)

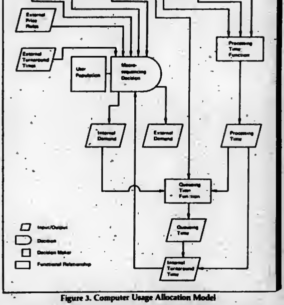


Figure 3. Computer Usage Allocation Model

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(Continued from In Depth/3)

turnaround times.

The time required to process a particular job on a computer will depend on some or all of the following:

1. Computer capacity (for example, rate of throughput, processing speed).
2. Processing mode (for example, single programming or multiprogramming, batch or interactive, real or virtual storage)
3. Microsequencing discipline (if setup times vary with job sequence or if jobs are in contention for the same resources).

It is assumed that the computer capacity and mode are fixed throughout the short-term planning period but the microsequencing may be varied to respond to variations in the arrival pattern of job types. The processing time relationship is shown in the upper half of Figure 4.

The queuing (or waiting) time for a particular job is the interval between the time the job arrives at the computer facility and the time it begins service. The queuing time depends on the properties of other jobs (such as arrival rate, pattern of arrivals, processing times) as well as the microsequencing rules in effect. The relationship between queuing time and other variables is shown in Figure 4.

The queuing times of external services are independent of the demand of users in the organization if the organization's usage of any single external service represents a small fraction of the capacity of that service. If the organization's usage is a significant part of the external service's capacity, then the external queuing time will be a function of demand, as it will be for the internal queuing time. Such a relationship, the *congestion delay function*, is discussed later in this chapter.

The turnaround time of a particular job is defined as the sum of its queuing time and processing time, that is, the interval between the time the job is submitted to the computer center and the time at which it completes service.

General System

The decision and allocative relationships combine to form the general system that is obtained by linking Figures 1 and 3. Figure 1 indicates the decision processes that determine the independent variables of the allocation functions of Figure 3. There are a number of implicit and explicit feedback loops in this overall process, as many of the inputs for the decision-making processes are generated from historic data that is fed forward from previous periods.

For example, the budgetary and pricing rules specified by central control may be based, to some extent, on the performance of specific rules in prior periods or in other systems. The feedback of turnaround time into the user demand allocation decision may or may not occur within the given period. If not, an *open-loop* system results; otherwise, the *closed-loop* system, shown in Figure 3, is obtained.

The desirability of explicitly introducing such a feedback loop into the control model is evaluated later in this chapter, when the stability of the system is considered. Clearly, the implicit feedback of turnaround-time performance cannot be avoided in most cases, although tampering with the response time of systems has been suggested.

(One theory is to introduce a minimum response time into time-sharing systems so that, when response time increases beyond the minimum, users will not react as adversely as they might if the comparison was made between immediate response of an unloaded system and longer response time. See L. Wright, "A User-Oriented Method of Computer Scheduling," presentation to the Northeast Region, Computer Measurement Group, New York, February 1978. Wright proposed a similar delaying tactic for batch systems in order to reduce the historical variation in turnaround time as the system load increases over time. Both approaches imply an aversion to the variance of turnaround time, which may be as great as or greater than the expected turnaround.)

Budget as Control Measure

In accounting, a budget is defined as "a financial plan serving as a pattern for and a control over future operations;" that is, a budget may serve as a *plan* and as a *control*. Stedry states that the objective of budgetary control is to "increase long-run profit at the fastest possible rate."[3] The role of the

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Name of Function	Independent Variables	Dependent Variable	Description
Processing time	1. Microsequencing discipline 2. Capacity of computer facility 3. Processing mode	Processing time for job *i*, *i* = 1, . . ., n	The time required to process a job depends on the rate of throughput (or capacity) of the computer facility, the processing mode (e.g., single- or multiprogramming), and, if sequence affects the setup times of jobs, the microsequencing rules.
Queueing time	1. Level and distribution of demand 2. Microsequencing discipline 3. Processing times	Queueing time for job *i*, *i* = 1, . . ., n	The time spent waiting in the queue by the job, that is, the time interval from the arrival of the job at the computer facility until it begins service. The queueing time depends on the arrival pattern of jobs, the processing times of arrivals, and the microsequencing rules.

Figure 4, Processing and Queuing Time Relationships

user budget in the computer usage allocation model is to induce users to maximize the long-run net value of computing for the organization as a whole. This can be achieved through the manipulation of certain characteristics of the budget itself, such as its level, perishability, transferability and destination.

The user's budget determines the upper limit of the quantity of computing resources that can be purchased subject to a given price and priority structure. The total of all user budgets indicates the maximum possible level of demand for computing during the period.

If the buget consists of hard money and external computing services are in unlimited supply, then the quantity of computing resources available to users is limited only by the size of the budget and the cost of services. If, however, users are given soft money budgets that can be used only for internal computer services, then central control can manipulate user demands by adjusting the total user budget and/or the capacity of the facility. Central control can provide users with purchasing power to buy more (based on specific rate structures) than the available internal supply, but then the physical capacity of the installation becomes the constraining force.

In practice, users will attempt to obtain larger budget allocations than their anticipated needs to avoid the possibility of running out of money and the need to renegotiate another allocation of funds. On the other hand, central control tries to limit budget allocations to those uses that have the greatest return and to avoid giving users excess funds that may be expended on relatively low-return jobs. In such cases, if a bargaining mechanism exists within the organization, the final user budget allocation will depend on the relative bargaining powers of individual users and their negotiating strength vs. that of other users competing for the same limited computing monies and central control.[4] Central control should relate its total user budget to the available internal capacity (particularly in the soft money case) and the percentage of allocated funds that it *expects* will be used.

Changes in Budget Level

Since the quantity of computing resources that users can purchase depends on the magnitude of the total computing budget *and* the price schedule of services, the potential demand may be controlled either by budgetary or pricing means. When the price levels of external services are not within the control of the organization, central control is limited to budgetary control. A tariff, which might take the form of a surcharge levied by the organization on each dollar spent on external services, could be used if the organization wished to have partial control over external prices.

Potential user demand may be adjusted dynamically throughout the budget period to bring the actual level of demand closer to the desired level. If this objective is to be achieved, however, it is necessary to know how users will respond to the frequency of changes and the magnitude of changes relative to the base level.[5] Furthermore, the timing of particular changes can have a significant effect on the responses of the user population.[6]

Budgetary means of dynamic control are more practical where there are relatively few individual user budgets. In this study, where there are conceptually many users, each with a budget applicable to computing, the many lines of communication necessary for implementing the budgetary method of control suggest that it generally would not be practicable; the use of pricing controls to regulate the level of demand over time would be more efficient.

The effectiveness of any budgetary rule is limited by the appropriateness of the pricing rule and vice versa. If a budget rule allocates funds beyond the profitable need of a user, the user is no longer constrained by pricing measures, since his utility of money is lower than that assumed by the pricing rule. It is important, therefore, to consider budgetary and pricing controls together and to integrate their mutual decisions.[7]

Perishability of the Budget

A user may be able to use his computing budget within the budget period in any convenient pattern; for example, he may use his budget evenly throughout the period or in a short interval, with negligible usage throughout the remainder of the period. If the budget period is long, relative to the average turnaround time of a job, central control may be unable to predict accurately the distribution of user demand over time, which could result in heavy value losses because of congestion at certain times in the internal facility.

The value losses would be lower with a more even distribution of demand. One solution to this problem would be a reduction in the budget period to lessen the variance in demand level.

(Continued on In Depth/6)

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Budget Type	Functions of Pricing Rule
Unrestricted Hard	1. Allocation of funds between computing and noncomputing uses 2. Allocation of computing demand between internal and external facilities 3. Limitation of maximum demand for computing 4 Regulation of demand pattern for internal computing
Unrestricted Soft	1. Allocation of funds between internal computing and noncomputing uses 2. Limitation of maximum demand for internal computing 3 Regulation of demand pattern for internal computing
Restricted* Hard	1. Allocation of computing demand between internal and external facilities 2. Limitation of maximum demand for internal computing 3. Regulation of demand pattern for internal computing
Restricted* Soft	1 Limitation of maximum demand for internal computing 2. Regulation of demand pattern for internal computing

*It is assumed that the use of funds is restricted to computing only

Figure 5. Pricing Control for Various Types of User Budgets

(Continued from In Depth/5)

Complex allocation of budgets can be expensive, however, so a trade-off must be mada between the benefits of reduced variance and the additional costs of a more complicated budget allocation system.

Another approach is the use of a perishable budget, which decreases over time regardless of usage and is furthar reduced by the purchase of services. This avoids tha buildup of large reserves of budgeted usage that, if demanded within a short interval, could overload the internal system. Variation of the perishability parameters provides central control with another means of controlling demand. The *transferability* of a budget is the transferring of budgeted funds among users, budget periods, or uses. The greater the flexibility of transferability, the less control the organization has over the level and pattern of nonscheduled user demand.

Destination Restrictions

Earlier in this book, the terms hard, soft, restricted and unrestricted were defined as they pertain to budgeted funds. Hard money may be spent either within or outside the organization; soft money is limited to uses within the organization only. Restricted funds may be used only for specified purposes; unrestricted funds may be spent on any profitable use.

Tha greater the restriction on the destinations of user budgets, the more accurate the forecasts of demand and the more effective the control can be; however, closer restrictions are mora costly to impose and require more and better information to implement effectively.

Tha feasibility of such control techniques must be judged relative to their long-term contribution to profits (or cost reduction). Their validity depends on the quality of information available about system parameters and the predicted behavior of users.

Control Through Pricing

Surprisingly little has been written about the control of computing resources through budgetary means — greater emphasis has been placed on pricing techniques. Little regard has been given to the prerequisite distribution of income (that is, budgets). Although tha effects of most budgetary controls can be achieved through pricing, thera are instances when budgetary controls are significantly superior (as in the case of restrictions of budgets to specific uses); therefore, a full treatment of price allocation also must includa budgetary allocation and the budget/price interaction.

Brown and Oxenfeldt have suggested that the function of prices differs depending on which point of view is being considered.[8]

Academic economists have considered prices as a device for allocating resources in some optimal fashion, rather than a cost recovery mechanism.[9] Businessmen select those prices that they expect will maximize tha long-term profits of their firms, whereas government representatives stress the public welfare role of prices.[10]

The primary purpose of pricing in this discussion is its role in allocating the demand for computing effectively. (Pricing also may be used to determine tha sequence in which jobs are serviced once they have arrived at the computer facility. This is considered in the subsequent section, "Price-Priority Rules.") The selection of a pricing mechanism depends on the budgetary controls in effect. Obviously, it is unnecessary to duplicate control measures.

Tha three major categories of pricing control used in the computer usage allocation model are:

1. The assignment of demand to internal and/or external suppliers of computing services.
2. The limitation of total demand level for computing in a given period.
3. The regulation over time of the demand pattern for internal computer services.

Pricing control does not hava to be used to channel demand to internal or external services in a soft money budget, since soft money is used only for internal services. Figure 5, which indicates the functions of pricing rules for a variety of budgetary restrictions, shows that the more constraining the budgetary means of control, the more limited the role of pricing in resource allocation. Clearly, it is the combination of budget characteristics that determines the role of pricing policy.

Pricing Rules

A number of pricing rules for the allocation of internal computing resources that have been suggested and described extensively in the literature are discussed in this section. Some rules are based on the cost of running jobs, some on specific properties of the system and others on the values of jobs. The appropriateness of any rule depends on the characteristics of the particular system.

The less complex cost-based rules consider only the costs directly attributable to the jobs themselves, whereas the mora sophisticated rules also consider opportunity costs.

Average-Cost Pricing

The popularity of average-cost pricing, especially in university computer centers, can be attributed in many cases to the insistence by government sponsors of computer-oriented work for its use. This pricing procedure requires that the total computing costs over a given period be assigned to individual jobs in direct proportion to the percentage of total usage that each represents. Since sponsored usage frequently represents a large percentage of total demand for the computer center's services, such sponsors often insist on this form of pricing to avoid subsidizing other computer users.

A major operational advantage of average-cost pricing is that the accounting calculations are relatively straightforward. It is necessary to maintain a record of costs and usage only, from which user charges can be obtained by simple ratio calculations. From the viewpoint of system effectiveness, however, this form of pricing has proved to have a number of serious faults.[11]

One disadvantage is that the actual prorated charges cannot be calculated until the pricing period is over. If predicted usage is the basis of *ex ante* pricing rates that are charged at the time of processing, then the revised *ex post* rates may differ considerably from the initial rates, requiring an account adjustment that might result in additional payments or refunds; either

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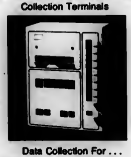

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way, the uncertainty of the final cost throughout the period is undesirable.

If users are billed at the end of the period, they will find it difficult to charge against their individual budgets during the period, since the actual charges will not be known. Another disadvantage is that the organization might be tempted to limit the use of the computer by internal users, thereby increasing the cost per unit of computing for both internal and external users. (Note that this does not contradict the assumption that computing is an intermediate good since only internal users are permitted to use the internal computer facility. The sponsor acquires something that embodies computing rather than computer services themselves.) This will increase the relative and absolute contribution of external users' funds to the computer center, assuming the level of external demand is not price-sensitive.

As an example, if the cost of the computer center is $1 million per year, and it is anticipated that 100,000 units of use will be charged out — 50,000 units to internal users and 50,000 units to external users — the cost per unit is $10. Here, the internal users will contribute $500,000, as will the external users. If the internal users are then limited to 30,000 units (by budgetary means, say), then total use is 80,000 units and the cost rises to $12.50 per unit. This results in a year-end adjustment in users' accounts to reflect the $2.50 increase in unit charges and an increase in external users' total contributions from $500,000 to $625,000.

Furthermore, the use of average-cost pricing encourages users to demand services from the internal computing facility during periods of heavy usage because of the resulting lower processing rates, which creates additional congestion. Average-cost pricing also discourages demand during periods of light workload since the low usage results in higher processing rates. These influences cause a divergence in the distribution of demand and supply for computer services, thereby reducing effectiveness.

A primary justification for using average-cost pricing would be the ease of calculating rates. Unless the computer center has no choice, however, because of sponsors' pressures, it is unlikely that this one advantage would outweigh the many disadvantages.

Marginal-Cost Pricing

A microeconomic argument is that the profit-maximizing organization should produce up to, but not beyond, the level of output that yields the greatest profit in a giver period. This is the level at which the marginal cost of production (the cost of producing one additional unit) is equal to the marginal revenue received (the revenue obtained from selling that additional unit), assuming that it is worthwhile for the organization to exist at all.[14]

In a nonprofit situation, the analogous rule is that, in a given period, the marginal cost and the marginal value (that is, the value of the additional unit rebounding to the organization) should be equal, which leads to a maximization of the total net value of the organization.[15]

Marginal-cost pricing is not directly applicable to the control model, since the computing services generated by the model's internal facility represent an intermediate good and not a final product. A modified marginal-cost analysis is appropriate in some cases, as is illustrated in the discussion on transfer pricing.

The basic objective of transfer pricing is to determine the optimal price at which goods should be transferred between two autonomous profit centers of a decentralized organization, so that the operations of the organization are optimized globally.

Pricing Example

Optimal internal pricing rules have been considered in a number of market situations by Hirshleifer, whose simplest example has two decentralized divisions: a manufacturing (or producing) division and a sales division.[16] The former is able to supply all of the intermediate good that the latter requires, with no external market to supply or demand the intermediate good. The marginal cost is assumed to be an increasing function of the output level for both divisions. All output units are identical, and the output is sold in a perfectly competitive market in which

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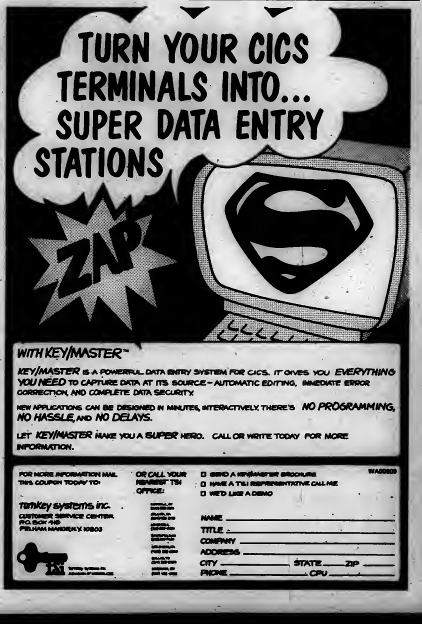

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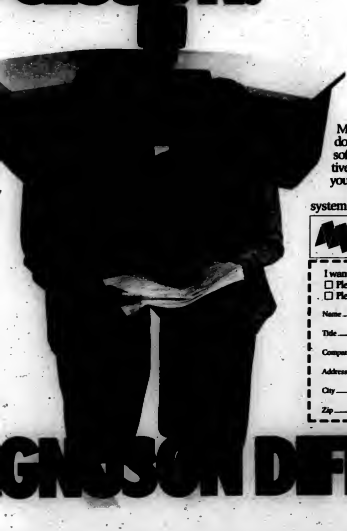

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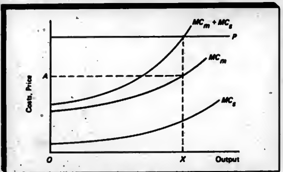

Figure 6. Determination of optimal output (OX) and transfer price (OA) for intermediate good, assuming perfect competition for the final product (price P) and no external market for intermediate good.

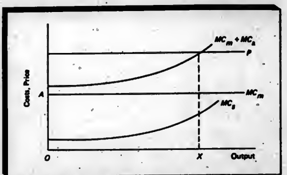

Figure 7. Optimal output cannot be determined at transfer price (OA) for intermediate good when marginal cost of manufacturing (or producing) division (MC_m) is constant with respect to output level.

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price is constant for all levels of output.

Under these particular conditions, the optimal policy of the organization is to generate the level of final product at which the sum of the marginal cost of the manufacturing (or producing) division (curve MC_m in Figure 6) and of the sales division (MC_s) is equal to the constant price per unit of output (*P*), which is an output of *OX* units. In order to induce the producing division to sell *OX* units to the sales division, central control must set the transfer price at *OA*.

Several problems arise when this type of analysis is applied to computing services. The marginal cost of computer services typically is very small. (This assumption occurs throughout computing literature. It is suggested that the high fixed costs of computing far exceed the variable costs, so the marginal operating costs are relatively negligible. See S. Smidt, "Flexible Pricing for Computer Services," *Management Science*, 14:B581-B588, June 1968.)

This leads to a paradox that is pointed out by Bierman[15]: If the marginal cost of the intermediate good, such as computing services, is constant with respect to output, then the producing division makes no profit if the transfer price is at its marginal cost. Furthermore, the transfer price does not provide the producing division with any guide as to optimal output because its profit is zero at all levels, as shown in Figure 7. The desired output is still *OX* units in this case, but this value results from the increasing nature of the MC_s curve.

Further problems arise when it is no longer assumed that the intermediate goods are homogeneous, indentical, time-independent and embodied in the final product in a fixed ration and that final goods are homogeneous and independent of time. The resulting nonhomogeneous and time-dependent goods are typical of computer jobs.

When the capacity is fixed, the optimal output of the intermediate good (with or without the existence of an intermediate market) can cause congestion in the system; therefore, the implications of opportunity costs arising from congestion delay must be considered. The almost constant marginal computing cost (equivalent to MC_m in Figure 7) would be appropriate only for low levels of output when there are negligible congestion costs. If delay costs are accounted for, the marginal computing cost curve would look more like MC_m in Figure 6.

Although the marginal *operating* cost of computing may be constant and virtually zero, the marginal *opportunity* cost resulting from congestion in the system would be increasing with output for moderately to heavily loaded systems, so that the paradox of Figure 7 is avoided. Nevertheless, even though the addition of opportunity cost to the marginal production cost allows the transfer price to determine the optimal output in this simplified case, the problems of nonhomogeneity and time sensitivity remain.[16]

Demand-Based Pricing

Some pricing systems relate to such factors as job characteristics, variation of demand over time and specific needs of users.

In a typical system, computer jobs impose a wide variety of demands on the facility: Some jobs require considerable intervention by the computer operator (such as tape mounting and loading of special forms into the printer), other jobs use only certain limited features of the system and still others tie up specific pieces of equipment exclusively, thereby making parts of the system unavailable to other users.

Smidt, for example, considers the problem of determining prices for specialized services used only by certain users.[17] The pricing of various measures of system utilization, such as elapsed time, compute time, disk space, disk accesses, cards read, setups and so forth, has been suggested by Nielsen,[18] and a number of commercial packages are available on the market to perform this type of pricing.

Peak-Load Pricing

A peak-load pricing rule relates the price charged per unit of processing time to the expected level of demand at given intervals. This form of pricing originally was developed for the allocation of electricity to users by a utility,[19] but also has been applied to computer services.[20] The basic approach is to charge a relatively high rate during periods of high use to discourage users and reduce potential congestion in the system. Lower rates in off-peak periods aim to attract users and increase utilization.

This equalizing of demand can reduce the capacity otherwise required to meet peak loads and can utilize more of the off-peak idle capacity, resulting in more efficient use of resources. If the peak-load pricing rule is respon-

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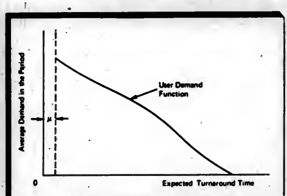

Figure 8. Average Demand as a Function of Expected Turnaround Time

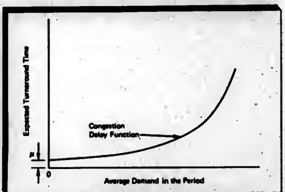

Figure 9. Expected Turnaround Time as a Function of Average Demand

(Continued from In Depth/10)

sive to users' true needs, and if users are able to alter their use of the system to increase the total net value of usage, effectiveness also will be increased.

Tolls or vouchers may be used as surrogates for peak-load pricing. Tolls must be paid to gain access to the computer and can vary with user or job type, time of day, day of week and so on. Vouchers are similar to tolls except that they are prepaid and, in a sense, act as a retainer that will ensure access when required. The computer center can predetermine the upper limit of access by using a voucher system. Both tolls and vouchers can be varied in magnitude over time.

The term flexible pricing generally is used for those pricing rules where rates vary in response to changes in one or more features of the system. This is different from rules that establish initial rates, ascribed to various features of the system, which do not respond to changes in the system. Thus, peak-load pricing may be flexible if it responds dynamically to changes in the level of demand, but it is not considered to be flexible if the rule adopts a predetermined rate schedule that remains unchanged for long periods.

The particular feature or features of the system that are linked to flexibility of price should relate to characteristics that are deemed important to the user or organization. For example, a user may be willing to pay any reasonable rate to assure service within a given time, or he may specify a maximum rate and accept whatever quality of service this might yield.[23]

Some rules that have been proposed link price to the value of jobs, as in an auction system where users bid against one another to obtain the desired service.[24] Several value-based rules will be developed in subsequent chapters.

Priority Rules

A further control mechanism is the multiple priority waiting line. A priority system requires that a higher priority job be given precedence over a lower priority job.

With budgetary priority rules, the priority category is an additional restriction on the budget. The different priorities may apply solely to microsequencing or may be used to control the time at which certain jobs may be run, which is analogous to the effect of peak-load pricing. This latter aspect of priorities will be considered in a later chapter.

In the case of price-priority rules different priorities are charged at different rates — the higher the priority, the higher the rate. In a purely price-based priority system, all users are able to purchase any level of priority that they desire and can afford. Control can be applied through budgetary manipulation, variation in the price-priority relationships and price levels.

With such complexity in control measures, it often is difficult to determine what combination of controls is most suitable in a particular situation. Later in the book, we discuss the effects of various controls on the user's decision as to when and where to submit his jobs. In addition, the effect of controls on the sequence in which jobs are submitted is discussed.

Stability of Model

In a control system that incorporates a feedback loop, the question of stability should be considered. Feedback control has been defined to be present "whenever control is effected through the comparison of the *actual* output of a system with its *desired* output."[25] In the system shown in Figure 3, there is feedback of internal turnaround information into the macrosequencing decision.

In the computer usage allocation model, the internal level and pattern of demand — which are partially dependent on the internal turnaround — determine the internal turnaround times. For the system to be in equilibrium, the internal turnaround times, which are the input of the feedback loop to the users, must be equal to the internal turnaround times that result from the users' demands.

The conditions that support a stable equilibrium and the parameters of the system that affect stability will be examined next.

Demand and Turnaround

It is postulated here that the level of demand at a given time depends on certain properties of the probability distribution of turnaround time: The greater the expected turnaround time and the larger the variance of the turnaround-time distribution at a given time, the smaller the level of demand. If the expected turnaround time for a job exceeds a certain limit, it would no longer be profitable for the user to submit the job, since the cost of waiting would exceed the value of running it. High uncertainty (or variance) in the time at which the job will complete processing is assumed to result in losses in user efficiency and convenience.

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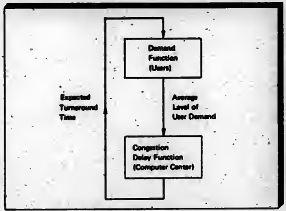

Demand Function (Users)
Average Level of User Demand
Congestion Delay Function (Computer Center)
Expected Turnaround Time

Figure 10. The Demand/Turnaround Feedback Loop

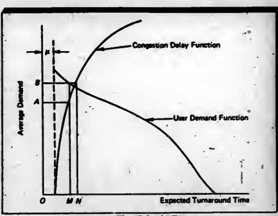
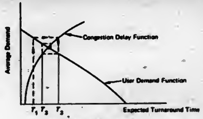
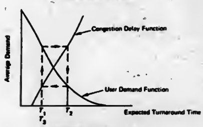


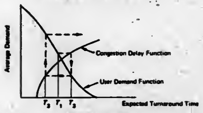
Figure 11. The "Cobweb" Diagram



(a) CONVERGING SYSTEM



(b) PERSISTENT OSCILLATIONS



(c) DIVERGING SYSTEM

Figure 12. The Iterative Feedback Process Under Various Functional Forms

One study found that user demand is "a decreasing function of maximum expected turnaround time under constant price and quality-of-service conditions."[14] Such a relationship, called the *user demand function*, is represented in general form in Figure 8. Average demand over a given period is a nonincreasing function of expected turnaround time, where μ is the mean processing time of jobs run during that period.

Since the capacity of the internal computing facility is assumed to be fixed throughout the period, it is clear from queuing-theoretic considerations that the higher the average demand during the period, the greater the congestion in the system and the longer the average expected turnaround time. The precise functional relationship depends on the sequencing rules and the parameters of the arrival and service systems.

In the case of random arrivals, exponentially distributed service times and a first-come-first-served queuing discipline, the form of the function — which will be called the *congestion delay function* — is as shown in Figure 9. A similar curve, relating the expected turnaround to the average demand in a given period, may be obtained under a variety of system assumptions.[15] Again, μ is the mean processing time.

Other characteristics of the turnaround-time distribution, such as variance, skewness and upper confidence bounds, also may be related to the average demand.

Equilibrating Process

If the analysis is limited to single variable functions (as in Figures 8 and 9) by considering average demand and expected turnaround time only, the stability of the system may be examined graphically.

A typical interaction, if such a feedback loop were invoked explicitly, would proceed as follows: Users receive an estimate of the expected turnaround time from the computer center, based on the administrator's prediction of demand and determination of turnaround from the congestion delay function. (The congestion delay function can be determined empirically, using historical values of demand [number of jobs, CPU utilization and so on] and the turnaround experienced at these demand levels. The demand must be converted to a single measure, such as processing time, for this approach.)

Acting in a manner corresponding to the user demand function, users respond with a specific demand; this demand information is then resubmitted to the computer center. If the demand is different from the initial estimate, the administrator recalculates the turnaround time, and the new turnaround time is resubmitted to the users. This cycle continues until the average demand proffered by users to the computer center corresponds to the turnaround time that was presented to the users by the computer center on the previous iteration, indicating that a stable equilibrium point has been reached.

A flow diagram of this process is shown in Figure 10. At equilibrium, the users submit the level of demand which produces the expected turnaround that itself induces the same demand level.

The next question is: Under what conditions will the system converge to a stable equilibrium?

Cobweb Diagram

The conditions for stability will be discussed using an analog to the *dynamic cobweb* of demand economics.[16] The user demand and congestion delay functions can be superimposed on one graph, as indicated in Figure 11. The axes of the congestion delay function are rotated through a right angle to conform with the axes of the user demand function. In this way, both the users' and the computer center's responses may be compared directly.

For example, if the computer center administrator estimates an average level of demand for the period of *OA* (see Figure 11), the expected turnaround time, from the congestion delay function, is *OM*. (The user demand is typically expressed in time units, although the particular measure, such as CPU time or total processing time, will depend on the specific installation under consideration and the characteristics of the jobs.)

The users then are informed that the turnaround time will be *OM* and they submit a demand, based on the user demand function, of *OB*. Since *OB* is different from *OA*, the computer center will revise its estimate of turnaround to *ON*. This process may converge to a stable equilibrium, diverge

(Continued on In Depth/14)

IN DEPTH

(Continued from In Depth/13)

or remain in persistent oscillation. The point of equilibrium is at the intersection of the two curves in Figure 11.

The behavior of the system depends on the relative slopes of the two curves, as shown in the three cases illustrated in Figure 12. Figure 12(a) shows convergence to equilibrium, which occurs if the slope of the congestion delay curve is greater than the absolute value of the slope of the user demand curve within the relevant range of demand and turnaround.

In Figure 12(b), the curves are related in such a manner that the cycle returns to its starting point on the congestion delay function. This is persistent oscillation, neither converging nor diverging.

It should be noted that the occurrence of persistent oscillations may appear as a result of the magnitude of the starting point (a turnaround of T_1 in this case). It is not necessary for the curves to be of constant gradient at all points for oscillatory behavior. A different starting point might result in either a converging or diverging system, depending on the relative slopes of the curves. In Figure 12(c), the relative slopes of the curves are the reverse of Figure 12(a), with the process diverging, and the system is unstable.

The equilibrium point can be readily obtained using analytical methods if the curves in Figures 8 and 9 can be defined by continuous equations. If D is user demand, T is turnaround time and is the mean processing time, the curve in Figure 8 can be expressed as:

$$D = \hat{D} - f_1(T - \mu), \qquad (1)$$

where D is the maximum user demand occurring when $T = D$ (i.e., when turnaround time equals processing time and queuing time is zero) and f_1 is some function that describes how the user demand falls as turnaround time increases. The curve in Figure 9 is given by:

$$T = \mu + f_2(D), \qquad (2)$$

where f_2 is a function describing the increase in queuing time resulting from heavier demand. Substituting (2) into (1) gives:

$$D = \hat{D} - f_1[\mu + f_2(D) - \mu]$$

that is,

$$D = \hat{D} - f_1[f_2(D)]. \qquad (3)$$

The equilibrium demand, D_E, is obtained by solving (3) for D, and the corresponding equilibrium turnaround time, T_E, is calculated by substituting D_E in (2).

A simple example will illustrate the procedure. Let: $D = 10.0 - 2.0(T - 2.0)$ and $T = 2.0 - 0.5D$.

This gives: $D_E = 10.0 - 2.0(2.0 + 0.5D_E - 2.0)$, which simplifies to $D_E = 10.0 - D_E$.

Therefore, $D_E = 5.0$ and $T_E = 2.0 + (0.5 \times 5.0) = 4.5$.

Equilibrium occurs at a demand of 5.0 units, for which the average turnaround time is 4.5 time units.

By recording the first three turn-

(Continued on In Depth/16)

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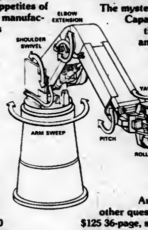

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Observation	Inference	Stabilizing Action by Computer Center
$\{T_2 > T_1$ or $T_1 > T_2\}$ and $T_3 = T_1$	Persistent oscillation	Quote false T between T_1 and T_2
$\{T_1 < T_3 < T_2\}$ or $\{T_1 > T_3 > T_2\}$	Convergence	No action—self-stabilizing system
$\{T_3 > T_1$ and $T_3 < T_2\}$ or $\{T_1 > T_3$ and $T_1 < T_2\}$	Divergence	Quote false T between T_1 and T_2
$T_{i+1} = T_i$, $i = 1, 2, . .$	Equilibrium	No action

Figure 13. Stabilization Action for Various Feedback System Behaviors

(Continued from In Depth/14)

around times of the process (shown as T_1, T_2 and T_3 in Figure 12), the computer center may categorize the particular system behavior into one of the three classes indicated, assuming that within the area of interest, the curves do not change their relationships to each other. If the third is turnaround time, T_3, falls within T_1 and T_2, as in Figure 12(a), the system is self-stabilizing and will converge to an equilibrium. When T_3 is equal to T_1, the system is of the persistent-oscillation type.

If the computer center submits a false expected turnaround time to users of a magnitude greater than T_1 but less than T_2, the system will approach closer to the equilibrium point. This procedure could be repeated until either the equilibrium point is reached or the process changes to one of the other two categories. The system diverges if T_3 lies outside the interval T_1T_2, as shown in Figure 12 (c).

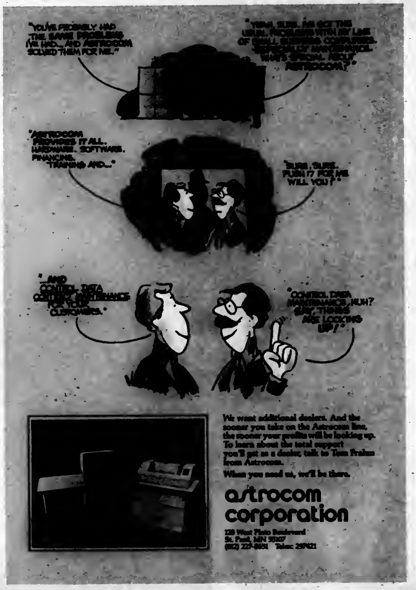
The quoting of a false expected turnaround by the computer center also may be applied here, as for the persistent-oscillation case, in order to induce users to reach equilibrium.

The system is considered to be in equilibrium when two successive turnaround times are equal. Figure 13 depicts how the computer center can identify various feedback behaviors and what actions it can take to attain stable equilibrium.

Parameters Affecting Stability

The aforesaid analysis is based on the relative slopes of the two curves in Figure 11. Since the user demand schedule represents the basic demand for computing, which is determined not only by the turnaround time but also by user budgets and price and priority rules, its form may be changed by manipulating these controls. The congestion delay schedule, on the other hand, is derived from the characteristics of the queuing system.

For example, increasing the capacity and speed of the computer facility extends the region of low-expected turnaround, such as in Figure 12(a) compared with Figure 12(c), where the latter represents a smaller capacity machine. This comparison implies that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larger, faster, lightly loaded computers are more likely to have a converging feedback process than smaller systems for the same user demand function. Conversely, the process is more likely to be unstable for a heavily loaded system with users whose demand levels are very sensitive to turnaround time.

Extensions to Allocation Model

The control model contains a number of simplifying assumptions to facilitate a graphical presentation. For example, it is a static model that does not consider changes in the demand and delay functions over time. Demand not only responds to turnaround time within a given time interval, it also varies with time of day, day of week, month, season and so on. Thus, the same turnaround response may produce various levels of demands at different times, resulting in perhaps a shift, or a change in shape, of the user demand function. By noting such changes, the computer center can respond to the dynamic nature of demand and avoid the danger of applying an outdated cobweb diagram.

The congestion delay function depends on the speed and capacity of the computer. Any change in the computer hardware or system software that alters the effective speed or capacity of the system will result in a modification of the congestion delay function. Also, different user types may be affected by different delay functions: For example, if several priority classifications exist, each will present a different expected delay schedule to users, with higher priority jobs having shorter expected delays for a given demand level for that priority. This can be represented by a series of curves, each of similar shape to that shown in Figure 9, one for each priority.

Since the organization will incur operating costs from the feedback process, the iterative procedure is justified on economic grounds only if it results in savings that are at least as great as the costs. The savings arise from increases in the total net value of jobs processed, which occurs when users experience a turnaround time close to the expected time. If turnaround is greater than anticipated, users may submit some jobs that have negative net value at the actual turnaround. If turnaround is less than expected, users may refrain from submitting some jobs that would have produced a positive net value at the actual turnaround, but which have a negative net value at the expected turnaround.

References

[1] *H. Bierman Jr. and S. Smidt.* The Capital Budgeting Decision. *Fourth Edition. New York, Macmillan, 1975, p. 152.*

[2] *E. Kohler.* A Dictionary for Accountants. *Englewood Cliffs, N.J., Prentice-Hall, 1956, p. 67.*

[3] *A.C. Stedry.* Budget Control and Cost Behavior. *Englewood Cliffs, N.J., Prentice-Hall, 1960, p.2.*

[4] *J.G. Cross.* The Economics of Bargaining. *New York, Basic Books, 1969. Cross develops an interesting analytical model of the bargaining process.*

[5] *A.C. Stedry.* Budget Control and Cost Behavior. *pp. 17-42, develops a mathematical model of a budget control system that relates changes in the budget to the behavior of the user.*

[6] *See J.C. Kinard, "The Effect of Variations in the Timing and Ordering of Presentation of Otherwise Identical Information on Expectations," Doctoral Dissertation, Stanford, Calif., Graduate School of Business, Stanford University, 1969*

[7] *This topic is dealt with from a practical standpoint in C.W. Axelrod, "The Computer Pricing Process,"* CMG Transactions, 18:3-2-3-13, December 1977. The pricing process is viewed as a complex series of decisions, beginning with a set of expenses and ending with a pricing policy, which have passed through a succession of allocation procedures.

[8] *F.E. Brown and A.R. Oxenfeldt,* "Should Prices Depend on Costs?" MSU Business Topics, 16:73-77, *Autumn 1968.*

[9] *N. Singer, H. Kanter and A. Moore. "Prices and the Allocation of Computer Time."* In: Proceedings of 1968 AFIPS Fall Joint Computer Conference, San Francisco. *Montvale, N.J., Afips Press, 1968, p. 494.*

[10] *J.R. Nelson. "Pricing and Resource Allocation: The Public Utility Sector."* In: Utility Regulation. *Edited by W.G. Shepherd and T.G. Gies. New York, Random House, 1966, pp. 58-87.*

[11] *Several writers have considered the effects of average-cost pricing on the allocation of computer services. See, for example, H. Kanter, A. Moore and N. Singer, "The Allocation of Computer Time by University Computer Centers,"* Journal of Business, *41:375-384, July 1968, and B.E. Goetz, "The Effect of a Cost Plus Contract on Transfer Prices,"* Accounting Review, *44:398-400, April 1969.*

[12] *P.A. Samuelson.* Foundations of Economic Analysis. *Cambridge, Mass., Harvard University Press, 1955, p.60.*

[13] *S.Smidt. "The Use of Hard and Soft Money Budgets, and Prices to Limit Demand for Centralized Computer Facility."* In: Proceedings of *1968 Afips Fall Joint Computer Conference, p. 501.*

[14] *J. Hirshleifer. "On the Economics of Transfer Pricing,"* Journal of Business, *29:172-184, July 1956; "Economics of the Divisionalized Firm," Journal of Business, 30:96-108, April 1957; "Internal Pricing and Decentralized Decisions," in:* Management Controls: New Directions in Basic Research, *edited by C.P. Bonini, R.K. Jaedicke and H.M. Wagner, New York, McGraw-Hill, 1964, pp. 27-37.*

[15] *H.Bierman Jr.* Topics in Cost Accounting and Decisions. *New York, McGraw-Hill, 1963, pp. 100-101.*

[16] *G.B. Dantzig and P. Wolfe, in "Decomposition Principles for Linear Programs,"* Operations Research, *8:101-111, February 1960, developed a computational method of decomposition that enables linear programming problems to be broken down into segments. This technique has been adapted to decentralized decision-making situations to obtain internal transfer prices that lead to the optimization of a global objective function (W.J. Baumol and T. Fabian. "Decomposition, Pricing for Decentralization and External Economics."* Management Science, *11:1-32, September 1964.) and to the quadratic programming problem (J.E. Hass. "Transfer Pricing in a Decentralized Firm."* Management Science, *14:B310-B331, February 1968.) The decomposition approach is still limited to homogeneous, time-insensitive intermediate goods and, therefore, is not useful for evaluating computer services.*

[17] *S. Smidt. "Flexible Pricing," pp. B595-B597.*

[18] *N. Nielsen. "Flexible Pricing: An Approach to the Allocation of Computer Resources."* In: Proceedings of 1968 AFIPS Fall Joint Computer Conference, *pp. 523-527.*

[19] *O.E. Williamson. "Peak-Load Pricing and Optimal Capacity Under Indivisibility Constraints."* American Economic Review, *56:810-827, September 1966.*

[20] *S. Smidt. "Flexible Pricing," pp. B588-B593.*

[21] *These are called the completion time specified (CTS) and maximum rate specified (MRS) rule by S. Smidt in "Flexible Pricing," pp. B586-B587.*

[22] *See, for example, N. Nielsen, "Flexible Pricing: An Approach," p. 527.*

[23] *S.E. Elmaghraby.* The Design of Production Systems. *New York, Reinhold, 1966, p. 333.*

[24] *C.P. Bourne, G.D. Peterson, B. Lefkowitz and D. Ford. "Requirements, Criteria, and Measures of Performance of Information Storage and Retrieval Systems." Final report to the National Science Foundation, Stanford Research Institute Project 3741. December 1961. Unpublished.*

[25] *See W.S. Vickrey, "Congestion Theory and Transport Investment,"* American Economic Review, *59:251-260, May 1969, for a similar formulation in transportation, in which congestion delay is related to traffic volume*

[26] *For a description of the economic application of the dynamic cobweb, see P.A. Samuelson,* Economics, *10th Edition, New York, McGraw-Hill, 1976, pp. 405-407.*

C. Warren Axelrod is a computer economist with 15 years' experience as a user, evaluator and improver of computer systems.

Recent involvements include the implementation of an automated scheduling system for a high-volume computer installation serving the securities industry and computer acquisition studies for a major oil company.

Dr. Axelrod has published 16 articles on topics ranging from computer resource management to information systems evaluation.

He holds a B.Sc. degree in electrical engineering and an M.A. degree in economics and statistics from the University of Glasgow and a Ph.D. in managerial economics from Cornell University.

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Voice Recognition: Today and Tomorrow

• Two NCC Debuts

ANAHEIM, Calif. — Aimed at the "hands-busy, eyes-busy" environment, two voice recognition entry devices debuted at the National Computer Conference here recently.

Developed by Heuristics, Inc. of Sunnyvale, Calif., the Model 5000 is a custom-printed circuit board that plugs directly into Lear Siegler, Inc.'s ADM-3A dumb terminal to make a self-contained, voice-activated CRT.

The second voice recognition unit — displayed by Interstate Electronics Corp., headquartered here — is also a printed circuit board that reportedly in ties with "a variety of" user systems via a full-duplex, 8-bit-wide parallel signal interface using TTL signal-level logic.

Besides the Model 5000, Heuristics has developed a free-standing voice controller connectable to any terminal or host computer through RS-232-C or 20mA current loop interfaces, according to the firm. The Heuristics 7000 sells for $3,000, compared with the Model 5000's price tag of $2,000.

Ascii Transmission

For both units, Ascii transmission, full- or half-duplex operation and 11 switch-selectable transmission from 50 to 19.2K bit/sec are standard. Their voice reference templates may be transferred through the communications ports to or from the host computer.

To be marketed through Lear Siegler's distributor network and customer base, the Heuristics units are based on a spectrum analyzer that reportedly uses state-of-the-art digital filtering and pattern matching

(Continued on Page 53)

• IBM Experiment

YORKTOWN HEIGHTS, N.Y. — While voice input devices that can recognize a relatively small number of words or phrases are already being introduced (see related article), IBM research scientists maintain that the task of having a computer recognize uninterrupted speech is far different from jobs such as controlling inventory, for which speech input products are typically used.

Use of a computer to transcribe with 91% accuracy speech based on a 1,000-word vocabulary and read at a normal speaking pace represents an " . . . early step along an enormously difficult path." Someday this step may lead to computer recognition of unlimited continuous speech, according to IBM's Dr. Frederick Jelinek, who heads the continuous speech-recognition group here.

Jelinek visualized the ideal voice recognition (VR) device as one that provides instantaneously transcribed speech as well as an immediate verbal editing feature to correct mistakes and make ongoing revisions as a person speaks into a microphone — in effect, a very advanced dictation machine.

"We are now working on the recognition of continous speech without the aid of artificial pauses between words or artificial constraints but with a limited vocabulary," he said.

The experiments are being carried out on an IBM 370/168 in a "quiet room" with high-fidelity equipment. The speaker talks into a microphone and, after a period of analysis that "may be quite long," the words as recognized by the computer appear on a terminal screen, according to an IBM spokesman.

"Our strategies are based not on rules developed from trying to intuit how people recognize sentences but on careful statistical modeling of all the speech processes involved: sentence production, speaker's pronunciation and processing of the speech signal," Jelinek continued.

Major Factors

Some of the major factors that are being considered by the IBM group include word separation, vocabulary, universal input, and response time.

Word separation is a factor in that one word follows another rapidly and continuously in normal speech so the computer must have some way of identifying within a speech stream the end of one word and the beginning of another, the company stated.

While computer programs have been designed for the recognition of artificial languages with as much as "perfect accuracy with a 250-word vocabulary," IBM said that this is done by limiting the choices of words at any point in the sentence.

(Continued on Page 53)

. . . And IBM's 'Talking Typewriter' Synthesizes Speech for Blind Typists

ANAHEIM, Calif — In an attempt to "expand the work force," IBM has introduced a voice-synthesized "talking" typewriter that reportedly gives blind typist "all the capabilities of sighted operators."

Demonstrated at the National Computer Conference here recently, the IBM Audio Typing Unit can be attached to the IBM Magnetic Card A, Magnetic Card II and Memory typewriters.

Functional key buttons on the audio keypad allow the typist to operate the unit and to activate any of the following audio responses:

- Pronouncing any individual character or key (except the margin release key) on the host typewriter.
- Spelling a word or a full line of text, character by character.
- Pronouncing a word.
- Pronouncing a full line of text, including punctuation.

Verbal Capitalization

When spelling or pronouncing a word or line of text, capitalization can be verbalized, an IBM spokeswomen emphasized.

If a word is typed incorrectly, it is pronounced as typed, permitting the typist to hear the error, she said. However, if punctuation or a capital letter is detected in the middle of a word, the word is automatically spelled rather than pronounced to alert the typist to a possible error.

With more and more woman moving into management areas, "secretaries are a dying breed," the IBM spokeswoman observed. The Audio Typing Unit precludes the need for a sighted co-worker to proofread typed copy, therefore "allowing more complicated work to be given to a single [blind] worker," she added.

Based on Mosfet chip technology, the machine allows the typist to input the copy into memory and make all corrections before printing out on paper, the spokeswoman said.

In addition, a more experienced blind typist has the option of typing without hearing the copy as it is input, thus allowing faster typing. An inexperienced blind typist, on the other hand, can be

(Continued on Page 54)

With BEALL Directing,
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Union Involvement Smooths Installation of Terminals

By Rita Shoor
CW Staff

MUSKEGON, Mich. – Good labor and management relations and allowing plant employees clear access to individual data records were significant factors in reducing employee resistance to the automated labor relations reporting system at CWC Textron's foundries here.

Before any of the equipment was installed, several meetings were arranged between John Kelly, vice-president and controller, and the union president. The system was explained to the union representatives and demonstration terminals were made available for them to try out.

"Our objective was to prepare them, and through them the employees, for the change," Kelly said. "It worked. Because we brought the union on board the acceptance by the employees was almost without problem."

The system, currently serving some 1,500 hourly employees in the Muskegon plants, includes 26 NCR Corp. 2820 series multifunction terminals, 15 NCR 2805 attendance terminals, 11 3102 CRTs and five medium-speed printers hooked up to a 64K-byte NCR Model 153 minicomputer. All terminals were provided by Data Pathing, Inc., a division of NCR.

Four-Phase Installation

"Installation was planned as a four-phase process," according to Edward Postema, manager, Management Information Systems Department.

"The first phase was a simple time and attendance reporting function which automated many of the time clock functions," he said.

"The second phase . . .. uses the more complex terminals for labor reporting. Employees can insert their badges and key in their operation and the number of pieces produced. No punched cards are used. We expect that this is the foundation of a comprehensive system of product inventory, scheduling, capacity planning and other functions."

The third phase, only recently completed, provides an interface between the mini and the company's 386K-byte IBM 370/135 host computer. This allows the mini to function as an on-line front-end device with some data stored on disk and other information passing to the mainframe via data communications lines, he said.

Phase 4 will involve the installation of sensors on production equipment to collect data automatically, speed up the data collection process and improve accuracy within the system. This stage will be implemented at some future date, Postema stated.

Planning Manpower

Installation of the employee-operated terminals has made information available to timekeepers and foremen on an "almost immediate basis," the company claimed. For example, after starting time for a given shift, supervisors can receive a head count of all people who have clocked in. This provides them with the necessary information to plan manpower for that shift.

After inserting his employee badge, the worker enters production information on the plant floor.

The ability to withstand the severe environment of foundry operations was an important factor in the choice of NCR Data Pathing terminals, according to a CWC spokesman. "With the success of the system in Muskegon, we hope to be able to use it with our other plants in Michigan and Indiana," Postema said.

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Voice Recognition Devices Unwrapped at NCC

(Continued from Page 51)

techniques to analyze audio input. The units can be trained to recognize up to 64 words or phrases, each up to three seconds in length, and are compatible with common programming languages such as Fortran, Cobol, Pascal and Basic, a company spokesman said.

The 5000 or 7000 can be trained or retrained "as often as necessary" to accept the voice or voices of the users and will "automatically reject utterances significantly different from the vocabulary set," the spokesman claimed. Rejection levels can be adjusted by the users.

The units add voice data entry capability while offering simultaneous keyboard entry capability, the spokesman emphasized. Both units come with a noise-canceling headset microphone with a 5-ft cord. Other microphones are available where headsets are inappropriate.

Besides data entry or inquiry, possible applications include counting or tallying operations, process control, management information systems, credit verifications, word processing and automated equipment control.

Interstate's Module

Interstate's Voice Recognition Module (VRM) comes in 40-word, 70-word and 100-word vocabularies at single-unit base prices of $1,650, $1,815 and $1,980, respectively.

An optional asynchronous RS-232-C or 20mA serial port enables the display of host output on peripheral devices, a company spokesman said. An additional option replaces the parallel interface to the host with a second serial interface that permits full compatibility with standard computer communications ports and their associated software drivers, he added.

The Interstate VRM also offers selectable threshold value for rejection of invalid words or background noise and is compatible with Fortran, Pascal and Basic languages.

Available options include the Voterm, a $700 chassis built to house the VRM. The Voterm contains all control switches, power supplies and connectors required by the VRM and "serves to speed up integration with the user system," the spokesman said.

A three-day training course was designed to provide systems designers with "the knowledge and skills necessary to efficiently master the VRM product and its associated development support tools," according to the firm. The workshop costs $600 for two people and $150 for every attendee beyond the original two.

VRM Emulator

The VRM Emulator — based on Interstate's intelligent voice terminal, the Voice Data Entry System — reportedly enables a system designer to "quickly detect confusing vocabulary words and build a data base for such features as automatic operator update training," the spokesman said.

The emulator is said to also permit rapid testing of proposed system designs without the need for expensive host system software modifications. Heuristics is located at 1285 Hammerwood Ave., Sunnyvale, Calif. 94086. The address of Interstate's Western Regional Office is 1001 E. Ball Road, Anaheim, Calif. 92803.

IBM Experiment Marks Progress

(Continued from Page 51)

The research group's work is based on a 1,000-word vocabulary drawn from words and sentences used by lawyers in submitting U.S. patent applications in the laser field. While a company representative conceded that the languages used by lawyers may not be considered conversational in the ordinary sense, he maintained that it is a language that was not especially developed for the purpose of computer VR and is thus classified as "natural" by Jelinek's group.

The number of sentences likely to be made from a particular vocabulary rather than the vocabulary by itself determines the difficulty of the recognition task, Jelinek observed.

"If there were a language that consisted of only one permissible way of arranging words into a sentence — even if that sentence contained 1,000 words — perfect recognition would be easy because the language would contain just one sentence," he said.

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GST Redesigns Integrated CAD/CAM Turnkey

SOUTH WINDSOR, Conn. — A system designed to integrate the computer-aided design (CAD) and computer-aided manufacturing (CAM) functions in order to reduce the time and cost from design engineering to finished product has been announced by Gerber Systems Technology, Inc. (GST) here.

First unveiled at the recent Numerical Control Society show, the IDS-80 has evolved from the IDS-3 graphics technology introduced by GST in 1973, according to Wilbur S. Mann, president.

Although certain IDS—3 design features have been incorporated in the later system, Mann described the IDS-80 as "essentially a completely new product" for the turnkey graphics industry.

Hardware for the system consists of a Hewlett-Packard Co. (HP) 2117F processor tied to a variable number of minicomputer-controlled terminal workstations. Display data and multiple picture transformation functions — scaling, zooming, panning, clipping and translation — are controlled within each workstation.

Vector Generation

Each IDS-80 workstation features a dedicated processor used for vector generation. In addition to the control processor within the terminal, GST offers an optional bit-sliced microprocessor which transfers certain software functions to firmware and reportedly improves character-generation and text-handling performance. Other options include a touch-sensitive programmable symbol data entry device and a cursor tablet.

The RTE-IV multiactivity operating system and a data management system (DMS) are major components of the system's software. A graphics package allows easy generation and manipulation of graphics display data by application programs, the company claimed.

Software products

IDS—80 also provides a range of software products: geometric modeling, automatic drafting or design detailing, finite element modeling, numerical control, printed circuit board design and schematic drafting, a company spokesman noted.

In addition to operating as a standalone turnkey system for CAD/CAM, IDS-80 can be linked to a larger mainframe-controlled network, he continued.

A minimal system with one workstation is offered for $195,000. Prices can go up to approximately $350,000, depending on the number of terminals and peripherals included. GST is at 40 Gerber Road E., South Windsor, Conn. 06074.

Drive Integrates Controller

ANAHEIM, Calif. — A series of general-purpose controller/formatter disk drives which reportedly operate on "about 85% less power and occupy less space" than comparable drives with separate controllers have been introduced by Century Data Systems (CDS), a Xerox Corp. company, here.

Designated the Intelligent Hunter (IH) series, it is plug-compatible with the CDS Intelligent Marksman disk drive series and, according to the company, offers a storage capacity ranging from 30 to 90M bytes.

Features include microdiagnostic error-fault location, a single function command structure, direct-memory access transfer, automatic interleaving set by switch or command, single sector transfer, alternate track assignment, full sector buffering up to 1K byte with switch-selectable sector size and boot command.

A hand-held maintenance test controller and a head alignment meter are offered as options, and production shipments are scheduled for the third quarter of 1980.

Per-unit prices range from $6,700 to $7,500, and OEM discounts are offered by Century Data Systems, 1270 N. Kraemer Blvd., Anaheim, Calif. 92806.

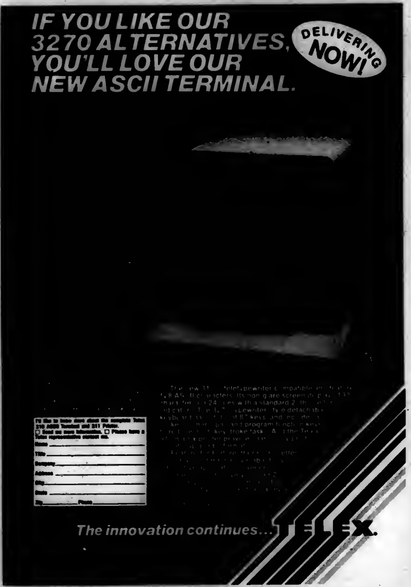
'Talking Typewriter' Aids Blind Typists

(Continued from Page 51)

"told" each letter or word as it is typed.

The unit allows the storage of 100 to 200 pages of copy on 50 retrieval bins, the spokeswoman said. Each bin stores up to 4,000 characters and a special loop interface allows the addition of an "indefinite number" of cartridges for "virtually unlimited vocabulary."

Now available through IBM outlets in San Francisco, Dallas and Chicago only, the unit costs $5,300 plus tax.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Supports Six Workstations

Wang Adds Low-End Mini to VS Line

LOWELL, Mass. – Wang Laboratories, Inc. has expanded its virtual storage (VS) computer line by adding a low-end minicomputer that can support a maximum of six workstations and up to eight other VS-oriented peripherals in its basic configuration.

The VS-50 system is reportedly geared to perform DP, word processing, key entry, electronic mail and telecommunications functions, all from the same workstation. The system's basic configuration consists of a CPU with 128K bytes of memory, an internal fixed-disk drive with 28K bytes storage, and archiving workstation and an internal 1.2M-byte dual-sided, double-density diskette for program loading.

The diskette could also be used to provide media interchange between the VS-50 and other Wang systems, 3741-type devices and the IBM Systems/3, 32, 34 and 38, a spokesman explained.

For extended applications, the VS-50 can be expanded to 512K bytes of memory and up to 32 workstations, he added.

Archiving Workstation

The VS-50's archiving workstation with an integral diskette drive was designed to provide more local control over the dispersed DP and word processing functions of the VS computer family.

The VS-50 system supports all of the firm's VS software. An optional Key Entry software product is also available that allows the user to key data directly through a workstation at machine speeds.

Prices for the basic VS-50 begin at $32,900 with deliveries scheduled for this November in the U.S. and December for foreign customers. Wang Laboratories, Inc. is located at One Industrial Ave., Lowell, Mass. 01851.

Nova-Based Packaged System Uses Business Basic Language

WESTBORO, Mass. – Data General Corp. recently introduced a packaged minicomputer system that utilizes the Business Basic language and can handle up to nine terminal users.

Designed for small businesses, the commercial basic (CB)/50 is based on the firm's Nova minicomputer architecture and is available in three models: the B3, B5 and B6. The B3 is the basic version and includes three CRT stations, 64K bytes of main memory, a 12.5M-byte fixed-disk drive with an integral 1.2M-byte diskette and a 60 char./sec Dasher terminals printer.

The Model B5 is similar to the B3, but has five CRTs, 128K bytes of memory, 25M bytes of fixed-disk space, a magnetic tape subsystem and a 300 line/min printer.

Finally, the Model B6 has five CRT stations, with the capability to handle nine; 128K bytes of memory; a 50M-byte DG disk cartridge susbsystem; a 300 line/min printer; a synchronous communications line; and RJE 80 communications software.

Software Support

Software support for the CB/50 machines is provided by DG's Real-time Disk Operating System (Rdos). The packages were designed to handle such functions as order entry, accounts receivable, payroll and other business chores. System users also have the option of adding Fortran to the systems to handle business forecasting, engineering and laboratory applications, a spokesman stated.

All systems include the license to use Business Basic and system utilities software, he added.

The CB/50 packages range in price from $27,250 for the B3 to $79,975 for the high-end B6, with delivery in 120 days. Additional information can be obtained from DG at Rt. 9, Westboro, Mass. 01581.

Winchester Disk Systems Run On DEC PDP-11s, LSI Micros

MONROVIA, Calif. – Four microprocessor-controlled Winchester disk systems that supply 10.4M or 32.2M bytes of formatted mass memory for Digital Equipment Corp. PDP-11 minicomputers and LSI microcomputers have been unveiled by Kennedy Co.

The systems consist of a microprocessor-based controller/interface, cables and either a Kennedy Model 5300-14 or 5300-42 Winchester disk drive. The KSC11 and KSC01 controllers emulate DEC's disk controllers and operate with PDP-11/04 to PDP-11/60 minicomputers and LSI-11, 11/2 and LSI/23 microcomputers, respectively, a spokesman said. The controllers are software-transparent to DEC's RT-11; RSTS-E and RSX11M operating systems and are fully compatible with the PDP-11 Unibus or LSI-11 Q-Bus.

The controllers take up two card positions in the CPU, the spokesman added.

The firm's Model 5300 single-disk drive supplies 10.4M bytes formatted capacity while the dual-disk models have 32.2M bytes of formatted storage space. The KSC11 controllers support up to four drives for a total of 128.8M bytes, and the KSC01 handles two drives for up to 64.4M bytes.

The systems reportedly provide direct-memory access transfers with a 128K-word bus-address range. A 2K-byte, high-speed random-access memory provides a three-sector buffer, permitting contiguous sector reads, the spokesman stated.

The 5300 series Winchester disks have a recording density of 6,000 bit/in. and a track density of 300 track/in. In addition, the disks have 700 track/surface and a data transfer rate of 8mHz. Both disk models automatically perform a 16-bit cyclic-redundancy check on header information and a 32-bit error-detection and correction code on the field, he noted.

For DEC's LSI-11, the 10.4M-byte system costs $7,325 while the 32.2M-byte version sells for $7,725. For the PDP-11 machines, the 10.4M-byte disk system is priced at $8,325 and the 32.2M-byte unit costs $8,725.

Delivery is in 45 to 60 days from Kennedy, located at 1600 Shamrock Ave., Monrovia, Calif. 91016.

HP Mini With Optical Scanner Scores Standard Coded Exams

Special to CW

IOWA CITY, Iowa – A collection of minicomputers and a special optical scanning device are saving teachers here a lot of time and headaches.

Westinghouse Datascore Systems, a division of Westinghouse Learning Corp., is currently using four Hewlett-Packard Co. 1000 minicomputers, a variety of HP disk and tape drives and an optical mark reader (OMR) to score some 15 million to 20 million computer-coded examinations each year. The Datascore system not only relieves teachers of the time-consuming chore of reading and correcting countless test papers, but can also process them far faster at about 600 sheet/min, according to Glen Metcalf, a sales service representative at Westinghouse Datascore.

The internal system consists of an HP 1000 "master" computer and three "slave" HP 1000s, each hooked up to an OMR. All of the computers have 32K-word memories. The master uses an HP disk drive, while the three slaves utilize HP 7970E 800 bit/in. tape drives. The system runs under HP's Real-Time Executive II operating system.

Two terminals connect with the master computer – one an HP 2640A used for program development and the other a Texas Instruments Inc. Silent 700 used for maintenance reporting and inventory.

Many of the tests scored by Datascore's OMR systems are the multiple-choice variety that require the student to pencil in an oval beside the student's chosen answer.

The OMR passes the test paper over a reading area, which in turn reflects light into a sensor that detects the presence and intensity of, or the absence of, marks on the sheet. The resulting matrix positions is fed

(Continued on Page 57)

TI Unveils Daisywheel Printer

HOUSTON – Texas Instruments, Inc. has introduced a letter-quality printer, designed to be used with the firm's DS990 models 4, 6, 8, 20 and 30 commercial computer systems.

The microprocessor controlled LQ45 printer was designed to be operated in conjunction with TI's recently unveiled Tipe-990 word processing software. The LQ45 features a 132-col daisywheel printing mechanism and functions at speeds up to 45 char./sec.

A single printer can be shared by several TI 911 CRT stations or may be used in a dedicated fashion, a spokesman noted. Printing can be on single or continuous forms, with an optional pinfeed forms tractor.

The printer costs $5,950, while the optional pinfeed mechanism sells for $280. Deliveries of the printer are scheduled for October 1980.

TI can be reached at P.O. Box 1444 M/S 7784, Houston, Texas 77001.

Mapped Memory Management

SEL 32-Bit Mini Includes Single-Slot Memory Module

FORT LAUDERDALE, Fla. — Systems Engineering Laboratories, Inc. (SEL) recently unwrapped a 32-bit minicomputer that incorporates a single-slot integrated memory module and a single-slot I/O processor.

The Concept/32's CPU features a 16M-byte mapped memory management system, instruction look-ahead and floating-point arithmetic instructions. The integrated memory module combines 256K bytes of error-checking and correcting memory with refresh logic and a variety of memory controller functions. However, the machine can be expanded to include up to 1M byte of directly addressable memory in the basic chassis, a spokesman said.

The I/O processor module functions include 16-device controller subchannels, four external priority interrupts, an interval time, real-time clock and an operator's console interface, he added.

The 32-bit machine is compatible with all previous SEL Systems 32 series processors through the unit's mapped programming executive (MPX-32) operating system.

The basic Concept/32, in a single-chassis configuration, costs about $25,000. The unit can be mounted in an industry-standard 19-in. rack, the spokesman noted from the firm at 6901 W. Sunrise Blvd., Fort Lauderdale, Fla. 33313.

MPU-Based Disk Storage Debuts

SUNNYVALE, Calif. — System Industries, Inc. has unveiled a microprocessor-based disk storage system for Data General Corp. Nova and Eclipse minicomputers that emulates DG's Zebra Series 6057, 6060 and 6061 disk systems.

The 3100 series consists of a plug-in controller and up to four Control Data Corp. storage module disk drives. The drives are available in 80M-, 300M- and 675M-byte capacities and can be configured for a total storage area of 2,700M bytes.

The heart of the system is the single-board 3100 controller that mounts within the minicomputer, using one I/O slot. The unit employs a 2901 bitslice microprocessor to achieve software compatibility with DG's operating systems and diagnostics, a spokesman pointed out. An optional dual-CPU capability is also provided.

Typical prices for the 3100 systems are $13,000 for the 80M-byte version and $20,500 for a 300M-byte disk unit.

Systems Industries is located at 525 Oakmead Parkway, Sunnyvale, Calif. 94086.

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Digidyne Cuts Prices On D120-16 System

SAN DIEGO — Digidyne has announced a 20% price reduction for its Model D120-16 system, billed as an alternative to Data General Corp.'s Nova minicomputer.

Effective immediately, the price of the computer is $2,500, which is $700 less than the system's previous price tag.

The D120-16 is software-compatible with DG's Nova instruction set and I/O bus and includes a maximum of 64K words of random-access memory. The machine's chassis can accommodate four I/O controller positions, and the computer operates under Bla/Cobol, Iris and Bits.

Digidyne is located at 2625 Ariane Drive, San Diego, Calif. 92117.

Transport Boosts Storage Of DC-300A Tape Cartridge

HAUPPAUGE, N.Y. — North Atlantic Industries, Inc.'s Qantex Division has introduced a magnetic tape transport that is said to quadruple the density of information recorded on .25-in. tape DC-300A cartridges from 1,600 bit/in. to 6,400 bit/in.

The Model 400 transport reportedly incorporates redesigned heads, electronics and recording codes and boosts the data capacity of DC-300A and similar cartridges from a previous maximum of 5.4M bytes to 22M bytes. Principal applications for the transport include use as a Winchester hard-disk backup or for Winchester off-loading, a spokesman said.

The Model 400 transport records four parallel tracks of data on a tape cartridge at a speed of 30 in./sec. The unit transfers data at the rate of 192,000 bit/sec, or 24,000 byte/sec. The device's search and rewind modes operate at 90 in./sec, permitting the transport to locate any data stored on 600 feet of tape within an average access time of roughly 40 seconds, the spokesman claimed.

Serpentine Mode

When transferring large quantities of data, the 400 can be operated in a "serpentine" mode that is said to avoid rewinding the tape to the start position prior to recording a fresh track. In this mode, the drive system automatically reverses the tape direction when one of the four tracks has been filled and commences recording on another track in the opposite direction.

The Model 400

When not operated in a serpentine mode, the 400's read-after-write recording head permits freshly recorded data to be read-out "on-the-fly" for verification and correction. The 400 is mechanically and electronically compatible with Data Electronics, Inc.'s cartridge drives and costs $1,585. The Qantex Division is at 60 Plant Ave., Hauppauge, N.Y. 11787.

SSB 6809-Based Micro Speeds Basic Applications

WESTLAKE VILLAGE, Calif. — Smoke Signal Broadcasting, Inc. (SSB) has introduced a 6809-based microcomputer system for small business users that is said to run Basic applications programs more than two-and-one-half times faster than comparable 6800-based computers.

At the same time, the firm also unveiled a multiuser Cobol designed to run on its microcomputer-based business systems.

The 6809 Chieftain Business System includes 64K bytes of main memory and a 20M-byte hard-disk drive that offers 10M bytes of fixed and 10M bytes of removable storage space. The micro system incorporates the firm's DCB-4 disk controller that is capable of handling four 8-in. disk drives, each storing 1M byte of data, a spokesman stated.

Up to 16 64K-byte blocks of memory can be addressed by the user, allowing up to 1M byte of memory to be accessed, he added. To meet specific requirements, the entire megabyte can be configured into 4K-byte blocks.

A wide range of programs are available for the system including payroll, accounts receivable and general ledger. In addition, the Chieftain supports Fortran and USCD Pascal.

In the same breath, the company also unwrapped an interactive Cobol package to run on the Chieftain series computers. The package reportedly controls all aspects of program development from initial input of source programs through compilation and testing to the final operation. The package runs under SSB's business operating system (BOS). The price of the software with BOS is $4,950.

The 6809-based microcomputer with CRT terminal and either a high-speed lone printer of letter-quality daisy-wheel printer ranges from $5,000 to $8,400, depending on disk storage. Word processing software is standard.

Additional information on the computer and software can be obtained from SSB at 31336 Via Colinas, Westlake Village, Calif. 91361.

HP Mini With Scanner Scores 600 Exam/Min

(Continued from Page 55)

into the HP 1000, which examines the pattern and scores the test. It should be noted that this same process is repeated for other applications such as order entry, surveys and financial applications.

The HP 1000 has also simplified the start-up procedure for Datascore employees. Each test has its own grading pattern or program. Instead of loading from tape, the operator simply enters a code name and the program is downloaded from the HP 1000.

During the peak seasons — fall and spring — the operators can run the system 24 hours a day, seven days a week.

Repairs can generally be made by Datascore's own engineers, by simply replacing a bad board. When the repair could not be affected in-house, Metcalf stated Hewlett-Packard's record for service and maintenance has been excellent.

Datascore's History

Datascore originated as the Measurement Research Center (MRC) at the University of Iowa in the early '50s. At that time, Dr. E.F. Lindquist developed the "optical mark test scoring device" that, in conjunction with a computer, sped up the scoring process.

"We used a different computer for almost every scanner built before we went with Hewlett-Packard," Metcalf said. "In fact, the Model I scanner transport was built in 1954 from a printing press and operated with a "vacuum tube computer" of our own design that virtually filled the rest of the room."

This dubious arrangement eventually yielded to computers supplied by one vendor after another. However, the problems with service, maintenance and reliability continued because many of the early computer companies folded after two or three years in business. With each change in computers MRC faced the expensive and time-consuming task of writing new software.

When Westinghouse Learning Corp. bought MRC in 1968, it became Westinghouse MRC and then, finally, Westinghouse Datascore Systems.

Datascore markets both its test-scoring and general data entry services as well as the OMR system to federal and state governments and general commercial accounts, Metcalf added.

In addition, the OMR system is used worldwide. The National University of Mexico uses the system to grade the extrance exams of more than 100,000 students each year, for example. The records of many American students passing through the halls of higher education will also pass through an HP computer when their American College Entrance Exams are graded by Datascore.

Datascore Systems have also been put to some unusual uses tallying votes in the local elections of three countries and helping to set up bike paths in Iowa City, Iowa, by scanning maps marked by local cyclists to indicate the most popular paths.

The HP 1000-driven OMR system processes 600 sheets per minute.

Disk Withstands Hard Conditions

SUNNYVALE, Calif. — An 8-in. flexible disk that is said to be capable of withstanding extreme operating and storage temperatures has been unveiled by Verbatim Corp.

The Optima Series XE disk series consists of single-sided flexible disks, enclosed in a protective Lexan jacket. The disks reportedly maintain their performance characteristics in operating temperatures ranging from 50°F to 160°F and can survive storage temperatures ranging from -40° to 160°F. The product's material and design were built to avoid warpage and subsequent data loss normally associated with extreme temperatures, a spokesman said.

The disks are priced at $20 each from the firm headquartered at 323 Soquel Way, Sunnyvale, Calif. 94086.

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IS056. Computer-Readable Data Bases: A Directory and Data Sourcebook, 1979 edition, Martha E. Williams.
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SC086. Fundamentals of Data Structures, Ellis Horowitz and Sartaj Sahni.
This book includes all of the topics important to data structures, including stacks, queues, lists, trees, hashing, sorting, searching, graphs and files. All of the algorithms are expressed in a structured form using a simple language close to PL/I, ALGOL or structured Fortran. $20.95

IS055. Videotext: The Coming Revolution in Home/Office Information Retrieval, edited by Efrem Sigel.
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SC084. Pascal: An Introduction to Methodical Programming, William Findlay and David Watt.
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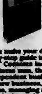

JD079. The Complete Guide to Your Own Business, Curtis Tate, Jr. et al.
"The book that can help you make your dreams a reality. A complete step-by-step guide to success and independence." Contents include: You as an independent business man, the challenge of owning an independent business, planning and organizing a new business, how to enter an existing business, managing and manning your business, designing and controlling work, sales forecasting, profit planning and control, managing sales, marketing your product or service, and more. $30.00

UC066. The Microprocessor and Its Application, David Aspinall, Editor.
A collection of articles that describe and explain how to use a whole range of computer components. Three areas are covered: the properties of popular micro components and techniques for use, the management of projects involving the interworking of hardware and software, and attainment of performance by advanced microprogrammable components. $38.50

WJ064. A Participative Approach to Computer Design, Enid Mumford and Don Henshall.
How to design computer systems that incorporate the human factor is the subject of this new book. It explains why office or shop-floor employees should have a major design role in computer systems, especially in terms of work organization and task structure, and shows how this involvement can lead to increased efficiency and job satisfaction. The book also explains how users can be given the ability to diagnose their own problems, set efficiency and job satisfaction targets, and develop alternative forms of work organization. The gains and problems associated with the participative approach to systems design are analyzed in depth. $19.95

UC068. BCPL—The Language and Its Compiler, M. Richards and C. Whitby-Strevens.
An introduction to the computer programming language BCPL, this book pays particular attention to programming style and to the design and portability of the compiler. The system-analysis phase of the compiler is described in detail and includes a realistic example of a typical application of the language. This and other substantial examples given in the book will be of interest both to serious users of BCPL and to compiler writers. BCPL reference manual included. $21.95

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$50 Million Investment Slated

Univac Plans to Make Semiconductors

By Connie Winkler

CW Staff

NEW YORK – Univac plans to manufacture its own proprietary semiconductors beginning in 1982, as part of a three-pronged course for the 1980s. The company has committed $50 million over the next three years to semiconductor manufacturing at the St. Paul, Minn., plant, according to Kenneth F. Thompson, group executive vice-president.

The in-house chip-manufacturing capability (initially for 16K, but moving to 64K chips) was made necessary by the increasing complexity and reliability needs of Univac for custom chips, he said.

The mainframe computer manufacturer is also looking at distributed DP and greater market segmentation in this decade.

The goal is to double Sperry Corp.'s revenue over the next five years, J. Paul Lyet, chairman and chief executive officer, told the May 29 meeting of the New York Society of Security Analysts here.

Increased R&D

In addition, on a corporatewide basis, Sperry intends to spend an additional $80 million on research and development in fiscal year 1981 above the $490 million it spent in 1980, $210 million of which was customer-financed. "Faced with a downturn in earnings or cutting research and development, we will take a cut in earnings," Lyet said. "We know where our growth has come from; we really would be impacting the future if we cut research and development."

In 1981 the Univac division plans to spend $223 million on research, or 12% of revenues, up from the $190.7 million (8.2% of revenues) spent in fiscal 1980, Thompson said.

Sperry expects its computer division, Univac, to lead the company through the 1980s and into the 21st century, Lyet told the stock analysts.

The company expects the current economic downturn to bottom out by the end of calendar 1980. Lyet's prediction that revenues will double in the next five years takes into account an 8% inflation rate. Sperry executives explained that inflation rate is an average which would vary over the five years, and which would vary domestically and internationally.

Earnings Status

Sperry's corporate revenue for fiscal 1980 ended March 31 was $4.7 billion, up 15% with net income of $277 million, up 24%. Earnings per share jumped from $6.35 for fiscal 1979 to $7.60 for 1980.

Univac for fiscal 1980 had revenues of $2.3 billion, up 10.3% over the previous year. Earnings improved despite a nine-week strike which impacted the production of Univac's successful large processor, the 1100/80, and the new mid-size 1100/60

(Continued on Page 63)

DG Launching Retail Program

By Marcia Blumenthal

CW Staff

WESTBORO, Mass. – After testing the retail waters for more than a year, Data General Corp. has decided to launch a full-scale retailing program.

Unlike its neighbor, Digital Equipment Corp., DG will not open its own retail stores, but instead will market three prepackaged systems in the $15,000 to $20,000 range through distributors.

These distributors will in turn target retail computer stores and office products dealers, according to Greg Fallon, DG's manager of retail distribution sales. Fallon estimated there are currently some 1,200 retail outlets, not counting office products dealers. However, DG does not consider all of these outlets qualified vendors and therefore has started a dealer certification program.

Decision Against Stores

In developing its retail sales strategy, DG considered opening company-run stores, Fallon noted. However, the firm finally nixed the idea because it would take too long to open the number of stores necessary for thorough distribution.

The company's General Distribution Division, formed in January, is responsible for overseeing the retail program.

(Continued on Page 64)

GSA Reorganizes Office For DP Procurement and Use

By Jake Kirchner

CW Washington Bureau

WASHINGTON, D.C. – The General Service Administration (GSA) office responsible for federal procurement and use of DP and telecommunications equipment and services has been restructured in response to changing information technology.

The reorganization of GSA's Automated Data and Telecommunications Services (ADTS), instituted May 12, is "a continuing move toward pulling together all the elements in information processing – integrating the DP and telecommunications" responsibilities of the office, according to ADTS Commissioner Frank Carr.

The changes, also directed at streamlining federal DP and telecommunications acquisitions, anticipate actions proposed in the Paperwork Reduction Act, now before Congress, Carr said in a recent telephone interview.

The Paperwork Reduction Act, which calls for more centralized planning and policymaking for federal information practices by GSA and the Office of Management and Budget (OMB), has passed the House of Representatives and is awaiting Senate action [CW, March 31]. Final congressional approval of the bill is expected sometime this summer.

OMB also recently reorganized its office of information systems policy along lines the legislation would mandate [CW, Jan. 29].

Three Divisions

Under the ADTS reorganization, the agency has three major operating divisions under deputy commissioners responsible for government wide management, federal program management and government systems engineering and operations. An ADTS executive director is responsible for budget, planning and operations of ADTS itself.

The office of governmentwide manage-

(Continued on Page 64)

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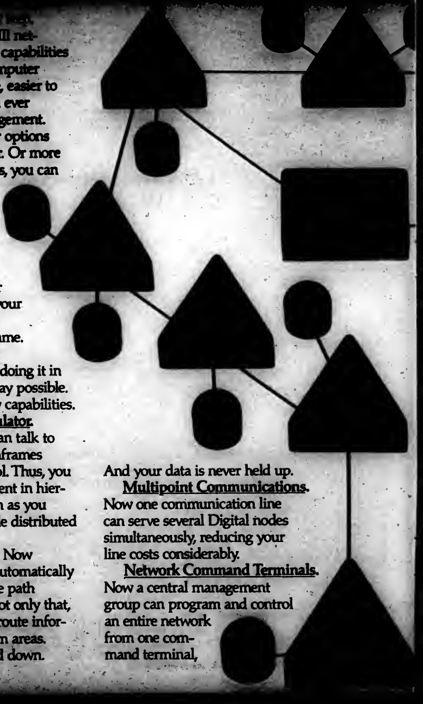

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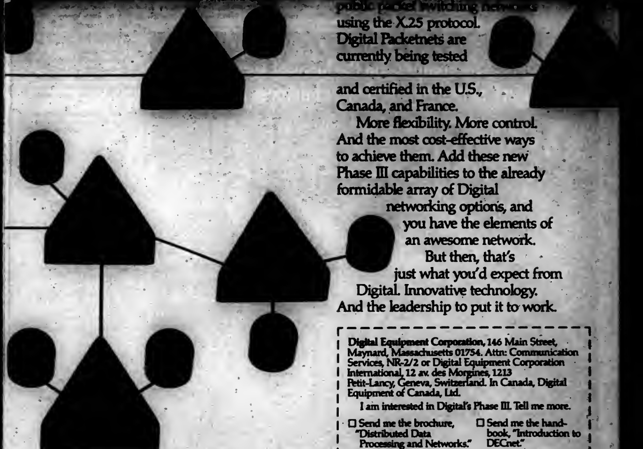

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Tenfold Increase in VAN Traffic Seen by 1985

NEW YORK — Value-added network (VAN) carriers such as Tymnet, Inc., Telenet Communications Corp. and Graphnet Systems, Inc. can expect to generate 10 times their current traffic, as measured in bits, by 1985, according to a data communications market and technology report by Frost & Sullivan Inc. (F&S).

Without protocol standardization in data communications, intelligent networks offer solutions to the problem of interconnecting dissimilar terminals and computers, Frost & Sullivan indicated.

The (F&S) report indicated that 43% of the data communications users responding to the survey already use VAN services, while another 24% are planning to do so.

These users range across all installation sizes, but the leading customer base consists of government agencies and big companies with annual sales exceeding $500 million annually, according to the report.

An analysis of the equipment market showed that VAN carriers overall can expect to add 400 nodes annually to their networks through 1981, F&S predicted.

Two Scenarios

The F&S report, "The Value-Added (Intelligent) Network Market in North America," includes two different market scenarios: analyzing the use of intelligence in a data network or placing the intelligence in the terminals. The scenarios are based on whether AT&T, via Advanced Communication Service, will or will not be a force in the VAN marketplace.

The report found that without AT&T, independent VAN traffic would increase from 2,640 billion bits in 1979 to 30,000 billion bits in 1985. With AT&T, the report showed less optimistic picture, with independent VAN traffic increasing only to 22,554 billion bits by 1984, to account for .8% of all such data transmission.

The report predicted that until other systems such as Xerox Corp's. Xten entry become fully operational, existing carriers will "enjoy unimpeded growth."

But, even with the increasing VAN usage, these carriers will take up only a small fraction of the total data communications traffic handled primarily by the common carriers.

In 1985, VAN revenues from all contenders, for example, are not predicted to exceed $722 million, compared with common carrier revenues, which already tallied $58 billion last year.

The report costs $950 from the F&S Customer Service Department, 106 Fulton St., New York, N.Y. 10038.

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Magnuson To Go Public

SAN JOSE, Calif. — Magnuson Computer Systems, Inc. will make its first public offering of one million shares of common stock this month.

The company, which manufactures and markets IBM plug-compatible processors, has already filed its registration statement with the Securities and Exchange Commission.

Blyth Eastman Paine Webber, Inc. and Hambrecht & Quist have been named managers of the underwriting group that will market the shares to the public.

Magnuson will use the proceeds from the sale of the stock to reduce its bank indebtedness and increase product development, marketing, field service maintenance and working capital.

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CDA, CLA Executive Bodies Agree on Merger

MILWAUKEE, Wisc. – The executive committees of both the Computer Dealers Association (CDA) and the Computer Lessors Association (CLA), headquartered in Washington, D.C., have agreed to merge the two organizations.

In most cases, the interests of the two trade associations overlap, and the proposed consolidation is expected to bring about a more united front, particularly in government lobbying and negotiations with IBM, according to CDA President William S. Grinker.

CLA Composition

While the CDA, with 145 members, is the larger of the two groups, the 20-member CLA is comprised of the third-party equipment industry's largest companies. The CLA is primarily comprised of lessors with equipment portfolios of at least $10 million, mainly in IBM systems.

Ed Cherney, president of the CLA, said he does not anticipate that any CLA members will object to the merger, as long as the interests of small, medium and large companies are represented by the new association.

When approved by members of both groups, the new trade association will be called the Computer Dealers and Lessors Association and will most likely be headquartered in Washington. The merger is expected to be completed in November, Grinker noted.

Officers Named

Both Jim Benton and Sidney Rose, executive directors of the CLA and CDA respectively, will serve as officers of the new association. Benton is considered to be an excellent public position activist, Grinker said.

During 1979, the third-party computer industry had revenues of more than $8.5 billion, with CDA members accounting for almost $3 billion of the total revenue. IBM equipment accounted for more than 95% of the business transacted by third-party vendors and lessors.

Univac Sets Course For 1980s

(Continued from Page 59)

Thompson said. Univac also lost $25 million in OEM work with the demise of the Itel Corp. computer operation.

Marketing Emphasis

Univac plans to emphasize marketing in industries where it is already most successful: government, manufacturing, communications, airlines and energy, Thompson said. The computer maker will bring to that area more distributed processing products including Univac's Distributed Communications Architecture (DCA).

Through marketing efforts, the company will also point out merits of sale and lease of computers. The analysts were interested in that $1 billion base of computers Univac has on financial leases. The lease means that Univac is almost "married" to the customer, and this means additional related sales, Thompson explained.

This year, Univac customers are being told that if they intend to keep the equipment for more than 66 months, they are better off purchasing. So far in fiscal 1981, financial leases are less than Univac planned and sales are increasing, Thompson said.

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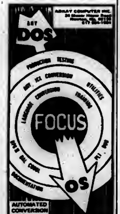

Duplicates Private-Sector Services?

Export Data System Starts Amid Controversy

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — A computerized export data system developed by the Commerce Department went into operation recently amid unresolved controversy over whether the system unnecessarily duplicates private-sector services.

The Worldwide Information Trade System (Wits), inaugurated May 20 in a ceremony in Dallas, was designed as a single source for U.S. exporters seeking information on overseas markets.

Starting out on a pilot basis, Wits presently links five U.S. cities and five cities abroad through Commerce computer facilities here. The system provides U.S. exporters with data on foreign buyers seeking specific products and services, information on potential buyers and agents abroad, market research information, trade show schedules and sources for additional data [CW, Aug. 27, 1979].

According to the Commerce Department, the system will eventually link by satellite 47 Commerce trade offices in the U.S. with its Foreign Commercial Service offices in 65 countries in an on-line DP/-telecommunications system.

However, the Information Industry Association (IIA), headquartered here, has been waging a two-year campaign against Wits, arguing it puts the government in competition with American firms already offering automated export information services.

In recent testimony before the House of Representatives, the IIA and several of its member companies, including Dun & Bradstreet, Corp. and *The Journal of Commerce*, complained the Commerce system ignores existing information services and could harm U.S. information vendors by undercutting their sales [CW, April 14].

Commerce officials, on the other hand, contend existing export information services are either incomplete or too expensive for the majority of companies trying to enter international markets.

During an exchange of letters with the IIA, Vernon Stansbury, deputy director, Commerce Bureau of Export Development, said: "We have heard . . . from many prospective users of Wits in the U.S. and abroad who insist that the information they need is not available from commercial information vendors, either at all or in the form they need and at a price they can afford.

"Even the larger user firms who can and do utilize private-sector sources extensively have complained of major gaps and deficiencies, particularly for information on the less-developed markets," Stansbury continued.

The Commerce Department also suggested firms offering trade information services could themselves use Wits to make their offerings more complete.

Compromise Plan

To resolve the impasse, the IIA offered a compromise Wits plan in which the department would interface with existing commercial data bases and augment them with information gathered by Commerce agents. Customers of the system could then benefit from private and government data sources and export information firms would not be harmed by government competition, according to the IIA.

Robert Willard, IIA vice-president, government relations, told *Computerworld* that negotiations between the association and Commerce, mediated by Rep. Neal Smith (D-Iowa), are continuing with future meetings scheduled to try to produce a mutually acceptable blueprint for the department's information system.

In a telephone interview, Maurice Kogon, Wits program manager, verified that stepped-up negotiations are under way. The two positions are "very close," he said, and could be resolved soon.

Commerce would like to resolve the matter within that time frame because it coincides with the schedule of Congress to take final action on appropriations requests for the Wits program, Kogon said.

The only point of contention remaining, he said, is whether Commerce should maintain its own Wits data base or rely solely on existing, private-sector data bases, as proposed by the IIA.

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GSA Office for DP Reorganized To Centralize Policymaking

(Continued from Page 59)

ment is responsible for plans and standards to ensure ADTS regulations and programs meet federal agency needs and are "integrated with equipment and service offerings of the marketplace," according to ADTS.

This office is also responsible for the ADTS software development activities, including the Federal Conversion Support Center and the Federal Compiler Testing Center.

The office of program management is responsible for federal acquisition and use of DP and telecommunications equipment and services as well as ADTS' own information systems.

The new office of systems engineering and operations is charged with planning, engineering and operating telecommunications, DP or hybrid facilities and services for federal agencies, and it develops policies and directives for federal telecommunications systems and DP services.

ADTS currently has a staff of approximately 2,700 people — almost 600 in the central office here and the rest in GSA regional offices around the country. The ADTS operating budget for fiscal year 1979 was $9.5 million, but the agency oversees government DP and telecommunications expenditures amounting to billions of dollars a year.

According to Carr, the ADTS reorganization is not directed at economizing the agency operations but is "to make us more effective in what we're doing . . . If we're more careful in targeting the areas in which we exert our efforts," he said, "we can get greater return for the same amount of resources expended."

As for speeding up the federal procurement process, Carr said, the changes will help primarily by streamlining ADTS assistance to federal departments and agencies, where, he said, most of the procurement delays originate.

ADTS will continue to review its operations and restructure its organization in response to new technologies, he continued, noting the agency is actively planning for federal automated office information systems.

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DG Sets Course for Retailing

(Continued from Page 59)

DG's regular field service staff will install and maintain the systems for end users.

DG now sells its packaged system built around the firm's Micronova MP/100 and MP/200 and the Nova 4/C processors in 50 outlets. By the end of September, the company expects to have 150 retail vendors, Fallon said.

While DG sells these processors to its OEMs for customized applications, the retail offerings are the firm's first prepackaged systems. These systems typically include the processor with 64K bytes of main memory, a mass storage device and a CRT all fitted in a desk or half-bay office configuration. The system includes the operating system and a business language capability, either Business Basic or Basic Extended.

Central to the retail program is the education of the small business owner, DG feels, so it has prepared a book, *The Insider's Guide to Small Business Computers*. In addition, DG will offer an intensive training program for its retail dealers.

While DG sees potential first-time small business users as a vast untapped market, it is also aiming to provide upgrades for these users as their businesses warrant. To establish a path for upgrades, DG has instituted a reverse referral program under which retail dealers will refer prospects to the regular sales force and vice versa.

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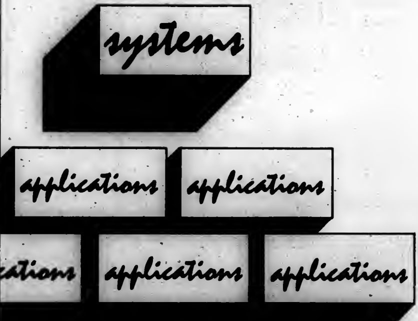

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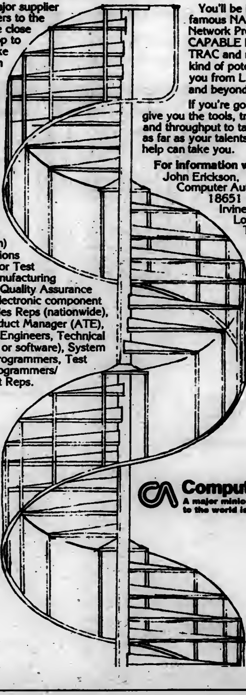

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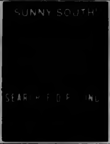

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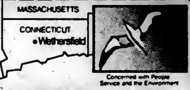

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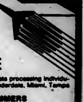

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Maintain, modify & enhance vendor supplied software. Write internal software. PDP-11, IBM Series 1 [illegible] RSX 11 M to [illegible] operating systems. ASSEMBLER.

SYSTEMS PROGRAMMERS [illegible]
For production IMS shops. Min. 2 yrs heavy IMS internals in IMS DB or DB/DC environment.

DATA BASE ANALYSTS [illegible]
Min. 2 yrs experience in IMS Data Base Design, DL1, PSB & DBD generation.

SYSTEMS PROGRAMMERS [illegible]
For production MVS shops. Will train OS/VS or SVS Systems Programmer w/min. 2 yrs exp w/Sysgens & Utilities.

PROGRAMMER/ANALYSTS [illegible]
Growth opportunities for Programmers; Prog/Analysts; Computer Analysts; Lead Programmers with min. 1 yr. exp in Commercial applications (COBOL, PL1, FORTRAN) or real-time programming (FORTRAN, ASSEMBLER). IMS a plus.

SYSTEMS ANALYSTS [illegible]
Min. 4 yrs experience Systems Design & Programming in manufacturing environment. [illegible] IBM 370/303X. OS/MVS/IMS experience a plus.

TECHNICAL ANALYSTS [illegible]
Min. 2 yrs Tech Support experience with OS/SVS, MVS, CICS, SNA, NCP, VTAM/ACF, VTAM or SDLC.

COMPUTER ANALYSTS [illegible]
Min. 4 yrs experience in design & programming of large scale on-line data base systems in an IBM 370/303X MP environment. Strong COBOL & OS-JCL required.

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User oriented problem solvers. Does NOT require programming experience. Strong knowledge of user areas within manufacturing environment required, i.e. warehousing, distribution, production planning, materials requirements planning, finance, etc.

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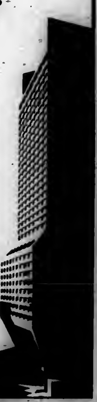

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[illegible]

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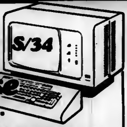

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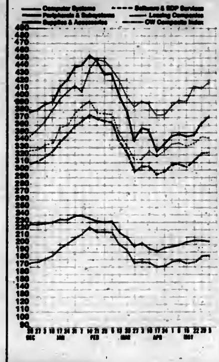
Computerworld Stock Trading Index



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Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, JUNE 4, 1980

All statistics compiled, computed and formatted by TRADE QUOTES, INC. Cambridge, Mass. 02139

COMPUTER SYSTEMS

EXCH		1979-80 RANGE (1)	CLOSE JUNE 4 1980	WEEK NET CHNGE	WEEK PCT CHNGE
N	AMDAHL CORP	19- 42	30 5/8	- 3/4	-2.4
N	BURROUGHS CORP	60- 88	71 7/8	+4 3/8	+6.4
O	COMPUTER AUTOMATION	9- 22	10 1/4	-1	-8.7
N	CONTROL DATA CORP	39- 63	54 1/2	+1 1/8	+2.1
O	CRAY RESEARCH INC	30- 50	40 1/4	-4 1/8	-9.0
N	DATA GENERAL CORP	40- 75	63	+3 1/4	+5.4
N	DATAPOINT CORP	44- 85	84 3/4	+3	+3.7
N	DIGITAL EQUIPMENT	52- 83	69 1/4	+3 5/8	+5.5
A	EECO INC	9- 19	12 3/4	- 3/8	-2.8
N	ELECTRONIC ASSOC.	9- 12	8 7/8	+ 1/8	+1.4
N	FOUR-PHASE SYSTEMS	20- 40	24 1/4	+ 1/2	+2.1
N	FOXBORO	31- 46	38 1/4	+2 1/4	+6.2
N	GENERAL AUTOMATION	7- 18	7 1/8	+ 1/8	+1.7
O	GRI COMPUTER CORP	1- 3	3/8	0	0.0
N	HEWLETT-PACKARD CO	44- 71	63 1/2	+2 1/4	+3.8
N	HONEYWELL INC	66-101	77 5/8	+ 5/8	+0.8
N	IBM	50- 79	58 1/8	+1 3/4	+3.1
O	MANAGEMENT ASSIST	9- 21	12 3/4	+ 3/8	+3.0
O	MANUFACTURING DATA S	22- 34	30	+1 1/2	+5.3
O	MINI-COMPUTER SYST	2- 6	2	- 1/8	-6.2
N	MODULAR COMPUTER SYS	9- 17	11 7/8	+ 1/2	+3.7
N	NCR	52- 82	62 3/8	+5 1/2	+9.6
N	PRIME COMPUTER INC	15- 29	26	+ 1/2	+2.5
N	PERKIN-ELMER	20- 47	44 3/4	+2	+7.1
N	SPERRY RAND	42- 58	49 1/4	+2 1/8	+4.7
A	SYSTEMS ENG. LABS	11- 22	17	+1 3/8	+8.7
O	TANDEM COMPUTERS INC	20- 50	43 1/4	+2 1/4	+5.4
N	TEXAS INSTRUMENTS	70-130	92 5/8	+2 5/8	+2.9
A	WANG LABS.	17- 40	34 3/8	+ 1/2	+1.4

LEASING COMPANIES

EXCH		1979-80 RANGE (1)	CLOSE JUNE 4 1980	WEEK NET CHNGE	WEEK PCT CHNGE
O	BOOTHE FINANCIAL CP	12- 20	15	- 1/2	-3.2
N	COMDISCO INC	8- 17	10 5/8	0	0.0
A	COMMERCE GROUP CORP	1- 2	1 1/8	- 7/8	-43.7
A	COMPUTER SYSTEMS AMR	2- 4	2	- 3/8	-15.7
N	CONTINENTAL INFO SYS	2- 10	1 1/2	- 1/8	-14.2
N	DATRONIC RENTAL	2- 3	2 1/2	0	0.0
N	DCL INC	4- 8	5 3/8	- 1/8	-2.2
N	[illegible] INC	9- 12	6 1/8	- 1/8	-3.0
N	ITEL	1- 10	3 1/4	+1 3/4	+116.0
O	LEASPAC CORP	1- 2	1/8	0	0.0
A	PIONEER TCS CORP	2- 4	2 5/8	- 1/8	-4.5
N	RELIANCE GROUP INC	24- 72	66 3/8	- 1/2	-0.7
N	U.S. LEASING	12- 18	15 1/8	- 3/8	-2.4

EXCH: N=NEW YORK A=AMERICAN P=PHIL-BALT-WASH
L=NATIONAL M=MIDWEST O=OVER-THE-COUNTER
O-T-C PRICES ARE BID PRICES AS OF 4 P.M. OR LAST BID
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SOFTWARE & EDP SERVICES

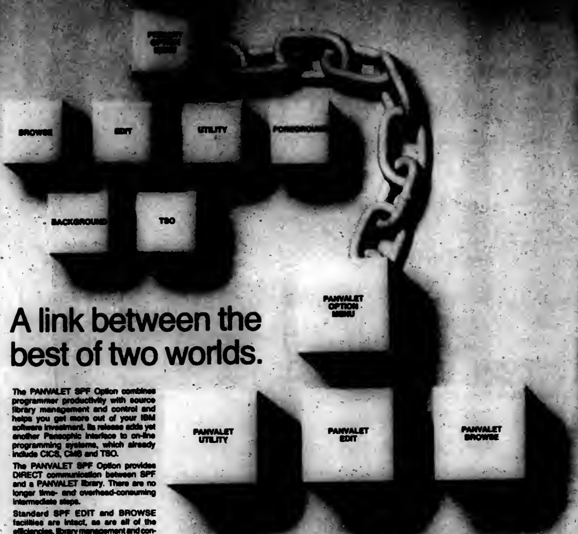
EXCH		1979-80 RANGE (1)	CLOSE JUNE 4 1980	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED COMP TECH	1- 3	2 3/8	+ 3/8	+12.0
O	ANACOMP INC	7- 15	12 3/4	+ 1/2	+4.0
O	ANALYSTS INTL CORP	3- 8	6 1/4	0	0.0
O	APPLIED DATA RES.	6- 14	8 7/8	- 1/8	-1.4
N	AUTOMATIC DATA PROC	31- 41	38 7/8	- 1/8	-0.3
O	COMPUTER HORIZONS	1- 4	3 3/4	+ 1/4	+7.1
O	COMPUTER NETWORK	4- 6	4 3/8	- 1/8	-2.8
N	COMPUTER SCIENCES	11- 24	18 7/8	-1 1/8	-5.3
O	COMPUTER TASK GROUP	1- 8	7 1/4	+ 1/2	+7.4
O	COMPUTER USAGE	2- 8	2 3/4	- 1/8	-4.3
O	COMPUT AUTO REP SVC	4- 10	6 1/2	+ 1/8	+2.7
O	COMSHARE	11- 20	13 1/2	+ 1/8	+1.0
O	CULLINANE CORP	18- 37	23 1/2	0	0.0
O	DATA DIMENSIONS INC	1- 6	1	- 1/8	-11.1
O	DATATAB	1- 4	1 1/8	0	0.0
O	DSI CORP	4- 8	6 1/4	- 1/8	-2.0
N	ELECTRONIC DATA SYST	15- 28	26	+1 1/8	+4.6
O	INFORMATICS INC	9- 22	14 3/4	- 1/2	-3.2
O	INSYTE CORP	1- 3	1 5/8	0	0.0
O	IPS COMPUTER MARKET.	2- 4	2	0	0.0
O	KEANE ASSOCIATES	3- 8	5 1/2	0	0.0
O	KEYDATA CORP	2- 8	2 1/4	0	0.0
A	LOGICON	12- 23	18	- 7/8	-4.6
O	MATHEMATICA INC	5- 13	9	+1	+12.0
O	NATIONAL DATA CORP	10- 20	16	+ 5/8	+4.0
O	PLANNING RESEARCH	5- 8	5 3/4	0	0.0
O	PROGRAMMING & SYS	1- 1	5/8	0	0.0
O	RAPIDATA INC	4- 7	4 5/8	- 1/8	-2.6
N	REYNOLDS & REYNOLDS	20- 34	29 3/4	-1 1/8	-3.6
O	[illegible] INC	5- 11	8 1/2	0	0.0
O	SCIENTIFIC COMPUTERS	5- 17	12 3/4	+ 3/4	+6.5
N	TYMSHARE INC	30- 50	44	-1 7/8	-3.7
A	URS SYSTEMS	5- 12	11	+ 3/4	+7.2
O	WYLY CORP	4- 8	7 5/8	+ 1/8	+1.6

PERIPHERALS & SUBSYSTEMS

EXCH		1979-80 RANGE (1)	CLOSE JUNE 4 1980	WEEK NET CHNGE	WEEK PCT CHNGE
N	AM INTERNATIONAL	13- 20	17 1/2	+ 1/4	+1.4
N	AMPEX CORP	14- 20	20 1/8	+ 3/4	+3.8
A	ANDERSON JACOBSON	9- 17	11 5/8	- 3/8	-3.1
O	APPLIED DIG DATA SYS	5- 10	6 5/8	- 1/8	-1.8
O	AUTO-TROL TECHNOLOGY	18- 40	31 3/4	+1 1/4	+3.7
O	BEEHIVE INT'L	3- 8	6 1/4	- 3/8	-5.6
A	BOLT, BERANEK & NEW	12- 22	17 1/4	+ 1/4	+1.4
N	BUNKER-RAMO	17- 32	28 1/8	+1 5/8	+5.9
O	CAMBRIDGE MEMORIES	1- 4	1 3/4	- 1/8	-6.6
O	CENTRONICS DATA CORP	20- 55	37 1/8	+3 1/8	+9.1
A	CETEC CORP	3- 7	6 5/8	+ 1/8	+2.2
O	COMPUTER DEVICES INC	5- 8	6 7/8	+ 3/4	+12.2
O	COMPUTRONICS	1- 4	2 1/2	- 1/4	-9.0
O	COMPUTER COMMUN.	4- 10	3 3/4	+ 3/4	+25.0
O	COMPUTER CONSOLES	4- 20	12 1/2	0	0.0
O	COMPUTER TRANSCEIVER	1- 5	2 3/8	+ 1/4	+11.7
N	COMPUTERVISION CORP	24- 58	54 1/4	+1 1/4	+2.3
N	CONRAC CORP	13- 25	14 1/8	- 3/8	-2.6
O	DATA ACCESS SYSTEMS	9- 16	10 1/2	+ 1/2	+4.0
A	DATA PRODUCTS CORP	11- 24	14 5/8	+1 1/4	+9.3
O	DATUM INC	2- 4	2 1/8	0	0.0
O	DECISION DATA COMPUT	2- 8	2 1/4	0	0.0
O	DELTA DATA SYSTEMS	1- 3	1	- 1/4	-20.0
O	DOCUMATION INC	7- 27	8	- 3/4	-8.5
O	DATARAM CORP	6- 37	9 1/2	+ 1/4	+2.7
O	ELECTRONIC M & M	2- 6	4	- 1/4	-5.8
O	EVANS & SUTHERLAND	21- 32	30	-1	-3.2
O	FABRI-TEK	1- 2	1 1/2	0	0.0
Z	GENERAL COMPUTER SYS	1- 3	2 1/4	0	0.0
O	GENERAL DATACOMM IND	12- 18	13 1/2	- 1/2	-3.5
Z	GENERAL TERMINAL CP	1- 4	2	0	0.0
O	HAZELTINE CORP	12- 30	24 1/4	+ 1/2	+2.1
O	HARRIS CORP	25- 48	33 3/4	+ 1/2	+1.0
O	INFOREX INC	1- 8	1 5/8	0	0.0
O	INFORMATION INTL INC	8- 10	9 3/4	- 1/2	-4.8
O	INTEL CORP	45- 75	67 1/2	+ 1/2	+0.7
O	INTERSIL	13- 33	28 1/8	+ 1/8	+0.4
O	LUNDY ELECTRONICS	6- 12	9 1/4	- 7/8	-9.0
O	MSI DATA CORP	5- 11	9 3/8	- 1/8	-1.3
O	MEMOREX	10- 26	13 1/8	-1 3/8	-11.7
O	MOHAWK DATA SCI	10- 20	15 3/8	+1 1/8	+7.8
O	ONEX	2- 10	7 1/2	- 1/2	-6.2
A	PARADYNE CORP	15- 27	20 3/4	+ 3/8	+2.3
A	PENRIL CORP	4- 15	8 5/8	+ 1/8	+1.3
O	RAMTEK CORP	10- 17	13	+1 1/4	+10.6
O	RECOGNITION EQUIP	8- 13	9 1/4	+ 3/8	+4.1
O	SCAN DATA	1- 5	1 1/4	0	0.0
O	STORAGE TECHNOLOGY	12- 21	16 7/8	- 1/8	-0.7
O	SYKES DATATRONICS	14- 27	25	0	0.0
O	T BAR INC	14- 20	18 1/2	-1	-5.1
A	TEC INC	3- 6	3 3/4	- 1/8	-3.2
N	TEKTRONIX INC	42- 66	57 3/4	-1 1/8	-2.0
O	TELEX	3- 8	3 1/2	+ 3/8	+12.0
O	TESDATA SYSTEMS CP	4- 26	8 3/4	- 3/4	-8.6
O	TIMEPLEX INC	7- 16	11 7/8	- 1/4	-2.0
O	WILTEK INC	1- 2	1 7/8	0	0.0

SUPPLIES & ACCESSORIES

EXCH		1979-80 RANGE (1)	CLOSE JUNE 4 1980	WEEK NET CHNGE	WEEK PCT CHNGE
A	AMERICAN BUS PRODS	8- 10	10	0	0.0
O	BALTIMORE BUS FORMS	1- 2	1	0	0.0
N	BARRY WRIGHT	13- 20	20 3/4	0	0.0
O	CYBERMATICS INC	1- 1	3/4	0	0.0
A	DUPLEX PRODUCTS INC	11- 33	31 3/4	+1 1/4	+4.0
N	ENNIS BUS. FORMS	13- 21	17 3/8	+1 7/8	+12.0
N	3M COMPANY	48- 58	56 5/8	+ 1/2	+0.8
O	MOORE CORP LTD	27- 34	31	+ 3/4	+1.1
N	NASHUA CORP	20- 35	23 5/8	- 7/8	-3.0
O	STANDARD REGISTER	22- 29	26 1/2	+ 1/2	+1.9
A	TAB PRODUCTS CO	13- 23	17 3/4	+1	+5.3
O	WABASH MAGNETICS	11- 18	12	0	0.0
N	WALLACE BUS FORMS	23- 31	30 1/4	+ 1/2	+1.6



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